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ABSTRACT

The objectives of this workshop were: (1) To provide assistance in the exploration of the technological and related issues, which include the latest techniques, methods for employment, equipment and benefits to be obtained from the application of computer-controlled typesetting and photographic composition; (2) To provide an opportunity for representatives of the various interest groups to meet and discuss papers prepared in advance by the participants on the most important issues in this field and (3) To provide a record of the proceedings for the broader use by the scientific community. The 45 participants of this two-day conference are listed. The gathering provided a unique opportunity for invited industry leaders to discuss computer composition among themselves. The material is presented in chronological order. The paper by Arthur F. Gardiner, "The Future Isn't What it Used to Be" is considered the challenge paper. The eleven prepared papers are followed by a "Statement of Problem Areas." The panel discussions, summary of the workshop and a bibliography are included. The index is arranged so that what was said by whom on what subject can be easily located. (Author/NH)

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COMPUTER COMPOSITION

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This volume contains papers prepared for, and a transcription of, the proceedings of the ASIS Potomac Valley Chapter sponsored workshop on December 8-9, 1970, in Washington, D.C. It also contains several papers reprinted from recent publications with appropriate attributions. Care has been exercised to preserve the exact meaning of the papers and the panel discussion statements, but no responsibility can be assumed for the opinions expressed which are solely the views of the individual paper writers and speakers and do not necessarily represent the opinions or positions of ASIS, which sponsored the workshop or the National Science Foundation, which provided funds for it.

PREFACE

Under the sponsorship of the National Science Foundation (NSF), many millions of dollars are spent annually by a variety of associations and societies to create or improve systems to enhance the flow of information in a variety of scientific fields. In the last few years, there has been a growing concern both in the NSF and in the private sector as to how well the NSF funded organizations and the printing and publishing industries are responding to the challenge of the new technology of information creation, transmission, storage, reproduction and retrieval epitomized by the use of the computer for composition and typesetting. This subject has also been of growing interest and concern to the American Society for Information Science (ASIS) in recent years. The workshop, sponsored by the Potomac Valley Chapter of the ASIS, through the auspices of the national ASIS organization, and funded by the NSF, is the result of that mutual concern.

A formal grant from the NSF to the ASIS in the spring of 1969 enabled the ASIS to sponsor an invitation-type workshop to assure representation from the diverse groups interested in the area of computer composition. These groups include: the printing industry, publishers, computer hardware manufacturers, other hardware manufacturers, software and system organizations, the universities, the government sector, consultants, users, and the unions.

A planning group, including Herbert Koehler, Executive Director of ASIS, Lowell Hattery, American University; Norman Scharpf, Executive Director of the Graphic Communication Computer Association (PIA); Donald King, Westat; Donald Pollack, NSF; and the undersigned met in the summer of 1969 to plan the details of the workshop.

Representative individuals from the above listed groups were invited to participate in the workshop. The objectives of the workshop were:

> "To provide assistance to the science information community in the exploration of the technological and related issues, which include the latest techniques, methods for employment, equipment and benefits to be obtained from the application of computer-controlled typesetting and photographic composition.
>
> "To provide an opportunity for representatives of the various interest groups including publishers, printers and service organizations, computer and equipment manufacturers,associations and societies, government, universities and institutes, user groups and consultants, and unions to meet and discuss papers prepared in advance by the participants on the most important issues in this field; and
>
> "To provide a record of the proceedings for the broader use by the scientific information community."

The cooperation of many people made the workshop and these proceedings possible. Appreciation must first be given to Dr. Burton Atkinson, the then Head of the Office of Science Information Services, NSF, as well as Messrs. Donald Pollock, Ed Weiss and Tom Quigley of his staff who have not only made the workshop possible but provided encouragement and support. Thanks should be expressed to the members of the planning group: Messrs. Koehler, Hattery, Scharpf, King and Pollock, who assisted the undersigned in many ways to assure success for the workshop. Particular thanks should be given to Donald King who fashioned the original proposal on behalf of ASIS. Acknowledgment is made of the interest and encouragement of the members of the 1969 ASIS Council who provided approval for the undersigned, as Chairman of the Potomac Valley Chapter of the ASIS, to chair the workshop. Appreciation is expressed for the cooperation of Norman Scharpf on behalf of the Graphic Communication Computer Association of PIA. Last, but not least, a wholehearted acknowledgment of appreciation is given to all the participants who unselfishly gave of their time and knowledge to make this workshop a success.

In the interest of encouraging informal communication, the full names, addresses and phone numbers of all the participants have been made a part of these proceedings. It is hoped that the workshop and these proceedings are but a prologue to a significant increase in both the understanding of this subject and the communication between the members of the various groups involved in computer composition and typesetting.

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INTRODUCTION

The subject of computer composition seems to lie at the fuzzy intersection between the printing world, the publishers and the computer industry. In considering the areas to be covered in the panel discussions, the workshop planning group proposed and then rejected many subject groupings. The final set chosen appeared to be those topics which seemed best able to subsume all other subject areas proposed. These topics included: user needs, hardware, software and systems, and cost and economics. Therefore, it was decided that these four topics would be the themes of the four sessions held on December 8-9, 1970, in the Washington, D.C. area.

The participants brought to the workshop a wide and rich variety of experience and background in the many fields related to computer composition. The panel discussions produced a montage of the cross currents, problem areas, plans, insights, and the communications (or lack of it) in this field. As one reads the statements of the participants made during the panel sessions, the impression is one of a rich, intellectual concatentation of the diverse opinions and positions of the participants in their respective fields.

Several participants prepared papers in advance of the workshop. Each participant was provided these papers as well as a number of other background papers (some of which are included in these proceedings and others of which are included in the bibliography) shortly before the workshop. Thus the panel participants had the advantage of the knowledge of the papers presented in the early portion of this volume.

It is hoped that the information in this proceedings volume will be made readily available to a broad segment of the various communities represented by the participants. Four major points emerged from the workshop:

1. The communication between the communities represented at the workshop could and should be significantly improved;
2. The ability to use computerized composition is now definitely available for economical use in certain classes of applications;
3. The nature of the activities of the associations and societies receiving grants from the NSF clearly fall within those classes of applications which can now profitably utilize the new computer composition and typesetting equipment.
4. Systems concepts and analysis must be applied to properly exploit these new techniques and equipment.

Even the reader who is well informed in the fields represented by the participants will find interesting and, perhaps in a few cases, useful information contained in the pages of this proceedings volume. The colloquial flavor of the panel activities was retained on purpose. To some, this may

seem less desirable than the more formal written style that might have been achieved. This could have been done, but at the cost of many lost nuances and even a few chuckles.

The format options of the proceedings were considered carefully and, after much reflection, it was decided to present the material in chronological order. The paper by Arthur F. Gardiner, "The Future Isn't What it Used to Be", which was presented at the COMPRINT 90 Conference in October, 1970, was considered the challenge paper for this workshop and is presented in these proceedings in the same role. The next paper by William Tunnicliffe was considered the keynote address and paper for the workshop. It and the paper by Leonard Shatzkin were papers addressed to the theme of user problems as part of Panel 1 on that subject. The papers by P.L.Andersson and E.R.Kolb were addressed to hardware, the subject of Panel 2; the papers by John Seybold and Victor Strauss were addressed to software, the subject of Panel 3; the papers by Ronald Wigington and Harold Drury were addressed to the subject of costs and economics, the subject of Panel 4; the paper by Frank Cremonesi explained the union's view; Henderson, the position of a typical service company; and Phillips, the educational institution's viewpoint.

The statements of the problem areas were gleaned from comments requested of the participants prior to and in preparation for the panel activities. This material, too, was available to the participants before the workshop.

If the papers and statement of problem areas are read first, the reader is in a better position to appreciate the comments made by the panel participants. As one reads the discussions of the four panels, it should be kept in mind that the subject designation of each panel was more a theme than a specific limitation to a particular subject area since it was recognized from the first that any grouping of subject areas is almost hopelessly intertwined. This becomes very clear as one reads the discussion in the various panels.

Even though the goal of the editor was to produce these proceedings in the shortest possible time frame, it was still possible to obtain a reaction to the workshop from the mid-December CIS Newsletter for inclusion in the proceedings. This excellent summary provides a good synoposis of what happened and relieves the editor of this task. However, it is hoped that this is only the beginning of a continuing dialogue not only among the participants but also among others in the various segments of the industry represented through direct means as well as associations such as ASIS, PIA, IIA, etc. and conferences like the COMPRINT 90 and the American University Annual Symposium in the field of computers, printing and publishing.

An attempt has been made to provide a reasonably rich index so that the reader can find out what was said by whom

on what subject. The bibliography is a somewhat extended version of what was provided to the participants. It is still far from complete but does list some of the more important documents published since the bibliography on electronic composition was published by the Government Printing Office early 1970 through the efforts of E. Raymond Lannon and the Chairman of the Federal Electronic Printing Community, John F. Haley.

These proceedings are also available in microfiche from the ERIC Clearinghouse, 1140 Connecticut Avenue, N.W., Suite 804, Washington, D. C. 20036.

The Future Isn't What It Used To Be

Arthur E. Gardner*

The title of my talk, "The Future Isn't What it Used to Be", was first used by Arthur C. Clarke, a scientist who may be best known as the author of "2001:A Space Odyssey" - the movie and the book - which featured an obnoxious talking computer named HAL. When I saw the movie, it had occurred to me that if Hal had ever been put in charge of a printing plant, the stockholders would have nothing to worry about - the computer would cheerfully murder the foreman and half a dozen or so pressman and militant typesetters and get the job done properly!

But Clarke doesn't always deal in fiction. Ten years before the first Sputnik was launched, he drew up all the specifications for communications satellites. And, he has since remained an authority in the field of communications technology. In fact, a few months ago I attended a lecture of his at Cal Tech in Los Angeles, and heard him describe an electronically-generated graphic communications system for the future. Since his batting average thus far has been about .750, I listened carefully.

"Within 10 years," Clarke predicted, "many households will be equipped with communications consoles. The console will consist of a television camera, a TV screen, a computer terminal, microfilm facilities, and a newspaper facsimile receiver--all linked to computers which, in turn will be linked to communications satellites...Any newspaper in the world, from the Wall Street Journal to Pravda, would be available to any user of the console, no matter where he lives. And, thanks to microfilm storage and retrieval, any newspaper ever printed (back to the 18th century) would also be available, as well as any book, magazine or pamphlet worth saving. Such material would be called up from a global electronic library - a central data bank linked to the total electronic nervous system of the world."

In my estimation, Clarke's vision is ridiculous...about as ridiculous as sending a man to the moon! If some of the Gutenberg-types here today are a little nervous about this proposed electronic nervous system, you probably won't hear anything much more comforting during the next 20 or 30 minutes. I hasten to emphasize, however, that I believe the printed word - and the printing world - have a great future ...but that future isn't what it used to be!

---

*Mr. Gardner, President of Technical Information, Inc., (TII) Los Angeles, California, presented this paper at the COMPRINT 90 Conference, sponsored by the Printing Industries of America, at the Waldorf-Astoria Hotel, New York City, Monday, October 12, 1970. TII is the parent company of Graphic Communications Weekly, Composition Information Services and Micrographic Weekly.

While most of the printing industry basks unbeknowingly in the self-satisfied splendor of five hundred years of hoary history, its technology is embroiled in a tremendous upheaval. When the haze now on the horizon clears, we will find that this is no longer a craft industry--unique or otherwise. Instead, printing will have become an integral part of a much larger and far more diversified graphic communications industry. The names of the game, as they say, will be electronics and computerization, information storage and retrieval, micrographics, data transmission, electrostatics, and all of the other so-called "buzz words" now buzzing around.

For a few, these changes are already increasingly evident within the framework of their own businesses. For the vast majority, however, tomorrow's technology perennially remains the abstract subject of seminars and cocktail hours. For all, there must be the realization that the industry's complexion and its constituents are rapidly changing. New technology is offering graphic arts the opportunity to operate in plants that are cleaner, more automated, and decreasingly dependent on traditional craft skills. Typesetting now flourishes in data processing facilities, and typesetters are becoming competent in five days - not five years! Traditional demarcations between plant departments are being toppled by the advance of integrated production systems, and yesterday's craftsmen are being crowded by technicians as computer-control gains momentum.

It is high time that printing's apathetic, hermit-like practitioners accept the fact that the industry is changing dramatically. The long standing dependability on craft skills is now characterized by the accelerating expendability of those same skills. Printers tools are fast giving way to those of the data processor, traditional markets are being molested by absolute strangers, and seat-of-the-pants management is posthaste headed the way of the dodo bird. Make no mistake--John Gutenberg and Ben Franklin notwithstanding--the future of this industry is being challenged as never before by the inexorable forces of change. Heretofore distant disciplines, notably the electronic media and micropublishing, are now treading heavily on the no-longer-sacred soil of printerdom...and the printer is no longer the sole purveyor of the printed word.

Discounting the ominous omens of half-cocked soothsayers, we have no doubt that, in one form or another, the printed word will survive the challenges of the next twenty years. The more important question is whether the printer, as we know him today, will be much in evidence by 1990. Based on a continuation of the complacency and relative stagnancy that has characterized this industry's technical progress during the past 20 years, it would not be unreasonable to anticipate that the average printer will be unceremoniously overtaken--if not completely overwhelmed-- by EDP, OCR, CRT, EVR, COM, CATV, and the host of other aggressive acronyms now probing the printer's moss-grown methods and massive markets.

Tomorrow's competition will not be letterpress vs. offset or hot-type vs. cold type. Instead, it will be the grizzly graphic arts versus micrographics, holography, lasers, facsimile transmission, electronic video recording, community antenna television, picturephone, electrostatics, telecommunications, computerized data banks, interactive terminals...to name some of the leading contenders for what used to be a nice secure, static business.

These are not terms for "2001:A Space Odyssey;" these are technologies that are here today being explored and exploited by a new breed of competition most of the printing industry doesn't even know exist! These are companies that now have a foot in your door and a hand in your pocket. And, these are the companies that will inherit your business if COMPRINT 90 is regarded as nothing more than a three-day, expense paid visit to New York.

Who are these companies? Infocom, Inforex, Inforonics, Datatronics, Interscan, Datascan, CompuScan, Images Enterprises, Image Systems, Micro Image, Micro Media, Microform Data, Datatype, Vistatype, Data Dimensions, Data Copy, Datacom, Dacom, Datatron, Logicon, Conductron, Systronics, Seaco, CompuPrint, CompuBooks, Computer Microforms, Computer Micrographics, Computer Micromation, Autonetics, Datagraphics, AutoGraphics, Computer Graphics, Comgraphics, Micro-Graphix, Matrographics, Graphicomp, and ElectroPrint... to name just a handful!

These are not product names. The sampling of companies I have just identified are live, vigorous young organizations that are already competing or planning to compete, directly or indirectly, with printers and lithographers, book publishers and newspapers, graphic arts equipment manufacturers and suppliers, and everyone else who earns his living in the traditional printing and publishing industry.

These are companies that probably don't know a pica from a piccolo or a hickey from a horseshoe. These are companies that think PIA is a secretive Government agency, and that MGD is in Hollywood making movies! And yet, these are the companies that are increasingly your most serious competitors. To ignore their presence is to die by default!

The printing industry is being threatened or, if you prefer, challenged by technologies it doesn't understand, and by companies it doesn't know. Computer output microfilm or COM, as it is usually called, has already started eroding typesetting markets, offset plates are increasingly being made from microfilm, newspapers are challenged by microform opportunities, and micropublishing poses an imminent threat to both book manufacturers and publishers.

Today's burgeoning involvement of microfilm in converting information into graphic images has thus far been characterized by the conspicuous absence of traditional graphic arts participation. The massive micrographic market

is being explored and profitably exploited by those we hazardously refer to as "outsiders" to the graphic communications industry. In the meantime, we're busy deciding on next year's Miss Printing Week!

One informed industry "outsider" recently stated: "It appears that micrographics could virtually eliminate the printed word as we know it today. The time is coming, and soon, when computer-produced microfiche will revolutionize education. Students will be able to store hundreds of textbooks in a small slot in their desks, and vast information thus available for reproduction from computer memory will never go out of print..." And, before graphic artisans have learned that microfiche don't swim, micrographics is already being challenged by electronic video recording. CBS Labs in Stamford, Connecticut has, for example, successfully tested a process for putting as many as 500 complete books on a single $50 EVR cartridge.

Suffice to say that microfilm "banks" and EVR cartridges will inevitably influence the need for the more cumbersome and expensive products of the printing press in many applications. To glibly dismiss the matter by indicating that nobody wants to take a microfilm reader to bed or cuddle up with a good cartridge is to ignore the inherent opportunities, and the hazards to existing markets.

And, how about the far-reaching challenge wrought by notable strides in communications technology in recent years. Ever-lowering line charges, faster transmission rates, data compression techniques, and other advancements are of direct importance to this industry and your business.

According to one constructively concerned publisher: "Direct facsimile transmission systems go furthest towards bypassing the printing process, and solve the multiple copy problem by providing each customer with a print-out device --essentially his own 'printing press'. The printout rate achievable with demonstrated systems is about an inch a second, so that a small sheet can be completed in a few seconds. However, since this is happening simultaneously at perhaps several million locations, the effective printing speed is enormous."

Elsewhere, one computer-communications authority commented that, "The concept of a 'reactive' medium or user control of his information environment, will make present publishing media as archaic as stone tablets within the next 20 years." Another, perhaps more dramatic--though nonetheless serious--source believes that, "Broadband communications will open a whole new world of information services during this decade, and should be regarded as a 'natural resource'."

I mention these challenges not as an extremist or a harbinger of doom, but rather to call your attention to the very pregnant fact that the printing industry can no longer survive and prosper in the same self-centered shell that

has characterized the past 530 years.

COMPRINT 90 was conceived to provide the industry with an unprecedented opportunity to take stock of where it stands today, and to map a strategy for survival in the years ahead. While there will, inevitably, remain some uncertainty as to the relative impact and importance of specific technological developments, there can be no doubt that the computer will play a pivotal role in the future of the graphic communications industry and, in a very real sense, in the futures of each and every business represented here today.

Regrettably, however, far too few have acknowledged the uncompromising consequence of the computer. Among those industry executives who have, we hear statements such as these: "By 1980, virtually all firms will be using computers--either their own or time-shared--and will increasingly disseminate information on magnetic tape, microfilm and other methods so fast that the conventional printer can't hope to keep up unless he also employs a computer."

A well-known newspaper industry manager has commented that, "Newspaper production will become so dominated by the computer that the pressroom will become an extension of the production computer. We will," he believes, "approach a system in which the pressroom becomes just another printout device." Reiterating the same theme, the widely discussed Fortune feature entitled "The Printed Word Goes Electronic" stated: "Current technology holds promise of a day when computers may be linked directly to printing cylinders, skipping all intermediate platemaking, in a continuous, all-electronic printing system."

Elsewhere, the head of a large, nationally-based graphic communications company had this to say: "God help the company which does not apply the computer to any form of processing needs more adroitly. As a practical matter, I think the time will come when a company's competitive rating will be based not on how many computers it has, but rather on how well the computers are applied to the real leverage points in the business."

Without belaboring this matter further, let us accept the fact that the computer has become an integral tool in the dissemination of information and, as such, its impact on the shape and structure of the printing and publishing industry will be intense and indelible. Inevitably, in the years that lie ahead, the computer will become as much a part of graphic communications technology as was the printing press itself in years gone by.

Before commenting on certain of the persistent problems that plague our industry, I would be remiss not to direct some attention to the threat posed by the rapidly increasing involvement of customers in production processes.

As a by-product of technological progress, and the frequent lack of industry initiative and involvement, we are faced with the phenomenon of customers taking advantage of the office-like nature of today's typesetting and reproduction processes, and their diminished skill requirements, to internally satisfy production requirements that were formerly handled by industry firms. And, once gone from your plants, such work is generally lost to the industry forever.

Needless to say, there is an uncommon need for an unprecedented measure of constructive communication between the printing industry and its customers during these technically tumultuous times. If present and prospective graphic communications buyers don't find leadership within the industry, they will seek alternate solutions--either outside the industry or within the innards of their own offices. If you have any doubts about this, you might, for example, think about the thousands of non-typesetters now setting type on IBM's Selectric Composer!

The question of so-called "outsiders" involving themselves in graphic communications procedures focuses the spotlight on one of this industry's fundamental problems. For far too long now, printers and their provincial progenitors have perpetuated the belief that they alone have been endowed by their creator with certain inalienable rights, not the least of which is the right to printer's ink in their blood. Perhaps it is this ink--which turns out to be a solution of carbon particles suspended in alcohol--that has dulled the senses of so many graphic artisans into thinking that theirs is--and always will be--a unique business.

Starting with its jargon, the printing industry has remained parochial and defensive for five centuries. Its constituents have characteristically dismissed as unrelated that which they don't understand, have taken comfort in the "mysteries" of their craft, and have resisted the inroads of "outside" influences. And now, ironically, the "chauvinistic male printer" faces the prospects of becoming an "outsider" in his own business!

As a result of his own self-imposed isolation, the concerned printer now finds himself part of an industry whose technology must, in light of the contemporary level of scientific attainment, be regarded as distressingly backward--the latest in hairline remedies and hickey pickers notwithstanding!

At this year's meeting of the Technical Association of the Graphic Arts, one prominent speaker put it this way: "As measured against other industries, printing is, technologically, still in the dark ages...weighted down by a tangle of craft fiefdoms whose interest in each other ranges from indifference to outright hostility. The whole is less than the sum of the parts!"

While there have been occasional islands of enlightenment, for the most part craft unions have not contributed to the industry's incentives for involvement in advanced electronic and communications technology. In fact, certain unions--notably the International Typographical Union--have effectively impeded the realistic application of such technologies. Certainly this has been obvious in New York.

Union laws and philosophies must become more responsive to these changing technical times, and their relationship to the industry's survival. The antiquated kind of thinking which holds that labor is served by "protecting" the worker from more efficient tools cannot help but put out of business the firm which provides the workers wages. It is anachronistic to apply issues of the past to techniques of the future. If only the non-union and private plants have the opportunity to realistically apply new technology, the aftermath leaves little to the imagination.

When established skills are needed less and less by an industry in the throes of rapid, far-reaching technological change, labor-management tensions and disruptions are inevitable. In the final analysis, however, the dispassionate economics of survival will determine who prevails.

Some years ago, commenting on the new and complex skills required to meet the challenge of changing technology, the late ITU president Elmer Brown stated: "If ITU members are ready, they get the jobs. If they are not ready, our great union could go the way of the horseshoers and barrelmakers."

In fairness, one cannot totally blame unions for the industry's failure to more rapidly embrace new technology. Too often, management has used the union as a scapegoat for its own lack of interest and initiative. This is clearly confirmed by the fact that those firms who have wanted to get involved without union restrictions have found some way to do so.

Printing industry management must, as never before, authoritatively exercise its prerogatives and responsibilities. In the past, virtually all of the basic improvements to graphic arts technology have come from the manufacturers' R&D, and management has historically relied on the manufacturing community to decide its product needs. Even now, in this computer era, the typical printing industry manager harbors the delusion that the electronics industry will take the lead in deciding what he needs.

This same lack of initiative is manifest in a sales effort that makes mockery of modern marketing methods. The days of the good time Charlie are numbered. That booze-buying, lunch-oriented order taker must be replaced by an informed graphic communications specialist who understands today's technical challenge and the influences of competing media. With major buyers becoming at least as knowledgeable technically as their suppliers, the poorly informed print salesman is becoming increasingly intolerable.

If the dividends of the industry's venture into tomorrow-land are to be fully realized, there must be a far more creative, intelligent, professional approach to marketing. Tomorrow's important printing contracts will demand thoughtful cultivation, and an understanding of many peripheral computer and communications disciplines. Those who elect to rely on the tactics and momentum of the past will find themselves rudely awakened by the sound of silent machines.

Moving along down memory lane, I would like to take a few minutes to comment on certain of this industry's venerable institutions in what I have elected to call the state-of-the-farce!

As openers, let's talk about graphic arts education. With extremely limited exceptions, graphic arts techniques and tools at the secondary school level are as stale as a bag of last month's bagels! Curriculums have not changed significantly in at least 50 years and, in this age of satellites and space travel, are still characterized by the clunk of battered type in a California job case and the clang of the ink plate on some antiquated hand-fed platen press. Progress in graphic arts education today continues to be measured in terms of a few new fonts of 10-point type each year, an adequate supply of type wash, and--above all--plenty of clean rags!

In light of the radical renaissance now in progress, the long standing shortcomings of graphic arts education stand out like a horse and buggy in a new car showroom. If the industry is to begin cultivating the human resources it must have in the years ahead, far less emphasis must be placed on tradition and far more on transition.

The industry must see to it that schools stop perpetuating programs that serve only to prepare students for futures in the local "Mom and Pop" shop printing business cards and wedding invitations. We must stop depressing students with the moss-grown message that Gutenberg made type move in 1440, and start impressing them with the fact Stromberg-DatagraphiX has, for example, made type move at 30,000 characters per second...or that RCA is setting Japanese on the face of a TV tube...or that electrostatics make it possible to print on the surface of an egg yolk...or that today's binary blast in the pressroom finds electronics harnessed in the remote control of all printing press variables.

The prerequisites for success in tomorrow's world of graphic communications will require an education that includes an understanding of electronics, computerization, chemistry, physics, optics, and the photographic sciences. The industry must take the time, spend the money, and find the ways to interest and attract students who would otherwise be headed for engineering careers in these fields. To do less is to remain checkmated by change, and fortify the forces of failure.

And how about the farcical, wasteful perpetuation of an inordinate number of industry associations, conventions, and trade shows. One might reasonably question how many of today's obviously overlapping institutions exist for the benefit of the industry, and how many dollar-draining, time wasting empires persist primarily to perpetuate the employment of their staffs.

Those that support "facsimile fraternities" must begin to seriously question what in fact is being accomplished. As an excellent case in point, what, if any, research and engineering has the so-called Research and Engineering Council of the Graphic Arts done at a time when the industry's survival is so heavily dependent on imaginative R&D? And, how many shows and seminars are staged mainly as a means of generating income to sustain the senselessness of organizations that duplicate efforts?

Referring to printing equipment expositions as "pseudo-events," an editorial in the British trade press recently fired a barrage of barbed comments, and concluded with the statement that, "If only the people who make money out of these exhibitions would throw themselves in their various lakes, we might have a few years of useful, steady, thoughtful technical progress!"

Apart from the resources wasted on duplicate associations, exhibitions, and meetings, such industry institutions are characterized by a degree of inbreeding that is inconsistent with the widening role of graphic communications technology. It behooves the industry to encourage the participation of interested "outsiders" in its activities, and the forward-looking executive should make it his business to become acquainted with computer shows and such "non-industry" associations as the American Society for Information Science, the National Microfilm Association, the Information Industry Association, and others.

Speaking of encouraging the involvement of "outsiders," it is significant to note that PIA's Graphic Communications Computer Association has recently taken just such a step by opening their door to non-PIA members. Less heartening is the fact that the industry's computer group has found it necessary to add to its managing director's duties the responsibility for such other sundry PIA sections as Cold Type Composition, Lithographic Platemakers, Security Lithographers, and the Trade Binders Section and Loose Leaf Division.

When one considers the singular importance of the computer to this industry's future, it is sad and shocking that after nearly five years the PIA computer section still has less than 100 members, and that it cannot support the full-time services of its own managing director.

And yet, industry plans are already underway to spend thousands of dollars on that self-congratulatory exercise known as Printing Week. Although somewhat difficult to reconcile with the facts, President Nixon's official statement

for the January festivities states in part that "...the printing industry derives its technological momentum from scientific effectiveness, and its economic strength from innovative management."

This year's slogan, promoted by the almost anachronistic International Association of Printing House Craftsmen, is "Adventures in Technology and Techniques." Although I'm not quite sure what that means, I would certainly hope that this year's "adventures" during Printing Week include something more meaningful and timely than the big-bosoms and back-slapping that normally characterizes the industry's annual spectacle of sell-aggrandizement. Why not forego the flowers this year, and send your money to some charitable organization sorely in need of your support--like PIA's Graphic Communications Computer Association!

As previously implied, if the industry is to survive it must delay no longer in entering the technological mainstream. The printing industry must actively expose itself to those technologies which now challenge the printed word. Isolation must give way to integration, and petty intra-industry process feuds must be replaced by the recognition that while pundits debate letterpress versus offset some pimply faced scientist nobody knows is seriously planning to do away with both!

We must forget the trees and find the forest. We must think in terms of tasks not tools, and products rather than processes. We must eliminate the restrictions of narrow departmental structures, and must view the roles of each as an integral part of a much larger effort. In short, we must accept the fact that to survive and succeed the graphic arts must become a multi-disciplined communications industry. Your role is no longer that of a printer, but that of both processor and disseminator of information.

The cry of "specialize to survive" that has been heard for the past 20 years must be reviewed in light of contemporary challenges. There is reason to believe that those companies providing access to a wide range of integrated graphic communications services will show the biggest profits in the coming decade. Mounting evidence points to a growing need for systems-oriented suppliers who can solve a customer's total information management problems. Why should you, as one observer put it, be satisfied with only ten or twenty cents of your customer's communications dollar?

It is of interest to consider in passing the number of small and specialized merchants who have gone out of business as consumers discovered the convenience and savings, in both time and money, provided by supermarkets, super drug stores, major department stores. A similar trend--that of the supermarket for communications services--is seen by some to be now developing in the commercial printing industry. And perhaps the only reason it hasn't had a stronger impact as yet is that the industry seems to remain at least 50 years behind the times!

Regardless of the technical shape tomorrow's profit-making business finally takes, it is safe to assume that its success will have been less a matter of technology than management. Today's need for professional management is unprecedented and uncompromising.

Also uncompromising is the role that the computer will play not only in generating new customers and applications for graphic communications, but in solving a host of scheduling, estimating, costing, and other control problems that have perennially plagued printerdom. And, as has already been evident in the typesetting sphere, computers will bring to the industry the need to analyze both old and new processes as complete systems, not simply as individual machines. This is essential for it will be the computerized system, not the computer per se, that lowers costs and saves time.

During a period of rapid technological change such as we are now experiencing, it is easy to lose sight of the fact that not everything that is new is good, nor everything old bad. What can be done is not always what should be done, and automatic is not necessarily synonymous with economic. Technological capabilities must be continually related to the realities of profitable production.

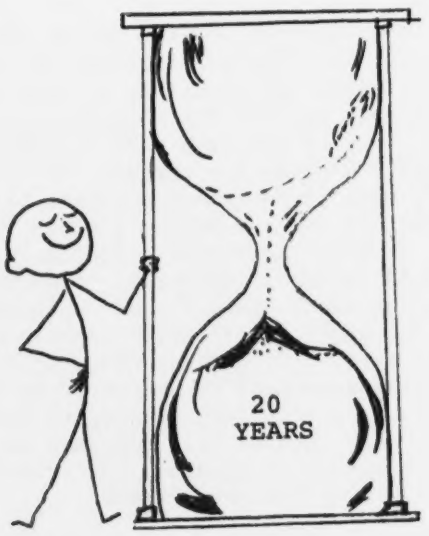
As never before, the industry must exhibit a forward, positive-looking disposition toward new technology. The too often prevailing attitude that "it just doesn't fit into our industry" must be changed to "how can we make best use of these powerful and far-reaching new technologies." There must be a renaissance of the same kind of initiative and imagination that once characterized this business. The incentives for pioneering, and the stakes for success have never been higher!

Far and away the most important question at the moment is whether one's emphasis should be on survival by perpetuating as long as possible the processes of the past, or growth based on the opportunities for market expansion and diversification afforded by the tide of new technology. Now is the time to make your commitment--to survival or to growth.

If the industry chooses to disregard what is now happening on all sides, there seems little doubt that the "printer" of the future will, as indicated, be a new breed--a part of industries heretofore unrelated to what we now call the printing industry. Or, at best, this industry will find itself faced with competitors with whom it is ill-prepared to compete.

In a very real sense, the future of your business and your industry now hangs in the balance. Those who take heed of the million dollars worth of expert counsel that will characterize the next two days of COMPRINT 90 will elect to grab the binary bull by the horns and secure their tomorrow. Those who remain unresponsive, and elect to "wait and see," will sooner or later be swept away by the tides of progress.

As evidenced by your presence here today, your company still has the resources to pursue technological innovation. Why risk waiting until it is too late to decide in favor of progress. You will probably never be in a better position to invest in tomorrow than you are today!



Exceprt of Letter to Arthur E. Gardner

Regarding COMPRINT 90 Presentation

December 3, 1970

Mr. Arthur Gardner
Publisher
Composition Information Services, Inc.
6331 Hollywood Boulevard
Los Angeles, California 90028

Dear Art:

...On another subject, Art, I am remiss in not writing to you previously regarding your statements at Comprint 90. PIA's assignment of four additional sections to me did not result from the inability of GCCA to support a full time Director. Rather, the move enabled PIA to strengthen all the groups, including GCCA. [GCCA's] finances are such that it could have continued to support [a full-time staff] without any burden. The consolidation of the five groups under one staff made it possible to extend that staff from two professional men to three, and thereby make a greater variety of talents available to each group. When the move took place in June, we added the services of Donald H. Goldman as Technical Director. Announcements of this vital addition were made at that time. [Other staff changes are underway] to enable us to bring on to the staff [additional] computer orientation to further broaden our scope of talents. [With these changes] one-half the professional staff will continue to [serve and] be supported by GCCA. In addition, we have completed arrangements with John Seybold to retain his services on a part time basis for GCCA. And we will continue to work with Dr. Carter Franklin, of the Wharton School of Finance, our Production Control Consultant, and other such individuals as the need arises.

It is my firm belief that the staff consolidation will continue to benefit all parties involved.

...

Sincerely,

/s/ Norman W. Scharpf

Norman W. Scharpf, Executive Director
Graphic Communications Computer
Association of PIA, Inc.

System X -- A User Need
William W. Tunnicliffe

I. PROLOGUE

((Mt. Washington from Lakes-of-the Clouds))* It is said of Patagonian storms that "the wind sweeps the land like the broom of God." In Boston we simply call it the Montreal Express! This view of Mt. Washington with the general climate of Labrador--and the highest recorded wind velocity on earth (231 mph before the anemometer blew away'.) --symbolizes a central issue as well as the "nature of the terrain." Shall one look TO the mountain or FROM the mountain.

((Computer Peripherals & Typesetting)) Mr. Phillips in his book has made two statements of interest: one of definition and tentative requirements (Printing....Composition) where he points out that printing is a mass production process applied to individually unique jobs and the phrase "individually unique" is a key point. Another of status (A Printer's Computing Language). The significant point of which is that there has been a lack of definition of the language requirement. The fact that since 1968, when this book came out, this status has changed by degree rather than by kind - or what physicists call a "band jump", is essentially why we are here. Further, it is suggested that implicitly our general span of concern embraces the intellectual, or editorial, pre-processing as well as the physical processes of preparation for printing.

((It Would Take 12 Typesetters, 7 Cameramen, and 13 Paste-up Girls Working on your Company publications, 24 Hours a Day for 8 Days to do what one VideoComp can do in less than 2 hours.)) If the promises of RCA as depicted in the Wall Street Journal and of Harris, Mergenthaler, and other possible output equipment contemporaries are to be fulfilled, it is suggested that what may be required is a new frame of reference. ((A New Frame of Reference)) We're here to discuss the role that composition will play in the business of information dissemination, and more particularly the role that computerized composition may play in that process. And the process, as some of you have already discovered and as others may discover, should they undertake this venture in mild insanity, will involve many things other than simple typesetting.

II. SYSTEM X-----MIND TO MEDIUM

The name of the work that we have undertaken in the Graphic Communications Computer Association has been given as System X because one knows that by far the most controversial, the most soul-searching, and most time-consuming efforts in any system development will be spent on the choice of the proper acronym. We decided to avoid all that.

* Slides are identified by double parentheses. Those underlined appear as figures and illustrations.

PRINTING .... COMPOSITION

Printing is a mass production process applied to individually unique jobs. This leads to a request for computer control that will still retain the versatility of the individual craftsman.

.... A. H. Phillips

A PRINTER'S COMPUTING LANGUAGE

There has been some discussion among printers and computer personnel on the need for a special language for printing and the form it should take, but there has been a lack of definition of this requirement.

.... A. H. Phillips

((System X)) System X is a conceptual outline from which, it was originally contemplated, a more detailed and more precise set of definitions might be drawn. ((Nelson's Crag to Valley Floor)) As you have by now concluded, *System X is intended as a view FROM the mountain.* ((Total Involvement)) As it is in mountain hiking, to say nothing of climbing, it will require total involvement, by all those who participate.

((TV or not TV? That's not the Question)) Most users accept the CRT as a fait accompli and have less present concern with hardware than with software. ((Tomorrow's Many-Splendored Tune-In)) The approach herein will NOT, therefore, deal with equipment or more remote concepts such as the consumer-oriented "instant-newspaper, or instant-document," but rather with software in a systems sense for less flamboyant but no less important purpose....((Classes of Photocomposition Equipment)) as it might apply to all classes of photocomposition equipment:

A. ELECTROMECHANICAL

1. Matrix
2. Disc
3. Grid

B. ELECTRONIC

1. Cathode-Ray Tube
2. Electron Beam

You are all familiar with hardware considerations. These include both the computer and the various kinds of photocomposition equipment that all have heard a lot of discussions about, and about which one can read in the textbooks. Some examples are John Seybold's "The Market for Computerized Composition," published by GCCA; Victor Strauss' "The Printing Industry" published by the parent organization, the Printing Industries of America----both authors here with us today, and Mr. Phillips' book on "Computer Peripherals & Typesetting", which you have just seen. These are mentioned just to refresh your memories on what there is available for any individual to study, to investigate, and to analyze in terms of his own particular requirements in the way of equipment. Hardware is the easiest thing to concentrate upon.

((Opportunities With Device Operation)) But is is NOT simply to develop opportunities for device operation in the narrow sense, ((Breaking a Language Barrier)) but rather to suggest the establishment of a coherent rationale----to break the yoke of too many languages, too incompletely understood, too difficult to gain entry to----((We build to Specification----and Reduce Processing Waste; Flexibility)) and to suggest that *the language at the process interface be an INPUT LANGUAGE OF IDENTIFICATION AND SPECIFICATION*, both comprehensive and comprehensible.

((Span of Concern)) Our span of concern ranges from manuscript input to photographic-medium output, ((Think Bank)) with content originating in the mind of a creator who thinks in terms of both verbal and visual imagery----and whose thoughts MUST, if one is to succeed, be translated into machine-readable form as early as possible in the process. ((Areas of Concern)) In our thoughts we shall be concerned predominantly with the first four areas on this list:

1. Systems
2. Functional Commands
3. Compiler Requirements
4. Tape Standards

III. THE PRESENT

((The Present)) There is an interpretation of the immediate past history in computerized composition which will be offered to place the matter in perspective.

((The Weapon Called Television)) The weapon, or tool, called television has been largely misunderstood. ((New, New, New, New)) The attractiveness of the medium and the novelty of the approach----in such sharp contrast to the past----have somewhat blinded viewers. ((Those Peerless Princes of Pitch)) Tangibles are far easier to market than abstractions. ((J. Gutenberg at his Press)) And even tangibles have left little discernible mark on conventional processors. ((Two Confidential-Information Heads)) Printers and trade compositors have, in the main, consulted their "usually reliable sources" ((Big Deal)) have drawn a conclusion, ((How to Succeed in Business Without Really Buying")) and adopted a course of action---- which the equipment manufacturers are quite aware of. (("O.K.---- So Impress me!")) Customers, in the main, have adopted a receptive attitude, perhaps best characterized by ((What's All The Noise About?)) "All right, I hear your message----now what's the price per page?"

((Don't Settle For Less Than A Fortune)) Of those intrepid souls who ventured forth, some were aware that they would pay the price of pioneering, some thought they had a guaranteed gold pump. ((Osborn Beast Chasing Man)) Of which-ever calling, each has found a voracious beast whose diet is, in the main, green dollar bills. ((Crazy Sale, Crazy Sale)) This has led, in the main, to what engineers sometimes characterize as "going-out-of-business sales", (("Books Are Dangerous. I Know What I'm Talking About.")) and sagacious observations by those who have experienced the ordeal....all bordering on, (("It Began as a Hobby....And Now It's in the Millions of Dollars,")) or immersed in, economic considerations. ((So Sad)) The recent Research & Engineering Council meeting can only be classified as an exercise in group psycho-therapy----the general tenor of which was worthy of Emmett Kelly. There was a sufficiency of *VENI* and *VIDI* but a positive dearth of *VICI*. Industry's Caesar can fairly be said NOT to have crossed the Rubicon!

It is submitted that the LACK of a suitably simple, yet reasonably comprehensive INPUT language----with related software linkages to whosever program you choose----may be far more of a contributing factor to the NON-USE of already available CRT capacity than is generally assumed, or accepted. ((Life Looks Different in Japan Because It Is.)) In the end, one had best view this whole matter with a certain fatalism, in the manner of the Orient. It IS a different world! To fracture both languages, our Dai Ichii concern (our number one concern) might best be said to be a concerted effort to define and develop such a language. And, in making this suggestion, I am not unmindful of another mountaineering saying: "Innocence is knowing you can and experience is knowing you can't."

IV. THE FUTURE

A. Wares, Laws, and Situational Analysis

((The Future)) What of the future? ((The Wars in Your Future)) Although recently it has been reported that "Apache Tribes Make Wampum Not War," one must sometimes make war before he can make wampum----the war ofachievement, technological achievement. ((One Has To Study The Old To Understand The New----A Japanese Proverb)) How shall we profit from this old Japanese proverb? Study to what end?....To translate from one world to another. ((Before You Start an Automated System, Decide Where It Will All End)) Borrowing from Aristotle's Metaphysics: "Those who wish to succeed must first ask the right preliminary questions" ----and, one might presume to add, these should include: (1) What are the goals? (2) What are the ground rules?

((Multiplicity Of Use)) It is NOT simply the immediately recognizable multiplicities of use:

A. SAME EDITION

1. Data Explosion

B. SUCCESSIVE EDITIONS

1. Data Update

C. ONE-SHOTS

1. Editorial Re-cycling

((Skills of the Hands and Senses Refined by Time)) but rather that the automation must extend capability, in a general sense, NOT merely supplant it.

((Business & Technical Systems)) If one looks beyond the hardware into some of the concerns that each will have as he tries this----one's first thought is that the business and technical factors are separate. And indeed they may be from the point of view of the sequence of your looking at them because you certainly have to know what technical things you have in mind before you analyze their costs. But the second and much more lasting thought, after you've gone through this and do a little bit of the arithmetic that relates to costs, is that these two are, as the saying goes, inextricably interrelated----which means you'll have a hard time justifying the cost. And when you get to CRT's you'll undertake a study that might well be entitled, "The Care and Feeding of Furnaces."

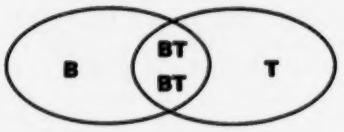
((The X Faces of Eve)) We've heard about the Seven Faces of Eve, and one can come up with about six that apply here. The name of this game, of course, is ware----with the w a r e spelling, for the moment. You've heard on previous occasions discussion of software, hardware, and peopleware as being 3 key elements in the creation of any system. The role that content plays, and the form which that content takes, in the eyes of the creator or the publisher assume a far more significant role as one tries to computerize composition than they ever had before. So one should at least recognize that this is an area that needs to be treated in a somewhat different way. The societal implications of this have to do with those existing and future craftsmen who are and will be in the industry that manufactures the document which is to be published. And businessware has to do with the economic glue that will hold this together or cause it to explode. All of which suggests to you that as you go through the calculations, one must beware, if you'll pardon the pun.

((Communications Within The Communications Industry)) The next slide enumerates both a philosophy and a list dealing with communications within the Communication Industry. It will give you some idea of a new set of roles and missions. There is the publisher who has some reason to produce a given document that reflects some author's opinion, contribution, or findings. On occasion there will be a customer's data processor, not necessarily associated with either the printer or any computer service bureau. There will be implicitly or explicitly a systems analyst who may or may not also be a systems synthesizer. But the process is none-the-less uniquely important to your success. There will be a data processing programmer who has dealt with the content and manipulation of that content but may have very little comprehension of, or desire to comprehend, what must be done in order to compose this in typographic form. There will be a composition programmer. There will be a data input processor. There may be more than one computer processor if you have one for data manipulation and the other for composition. And there will be the composition processor in terms of your photocomposition output device, be it electromechanical or electronic----as in the case of the CRT. There may or may not be a paste-up operation, depending on your success with pagination. There will be the

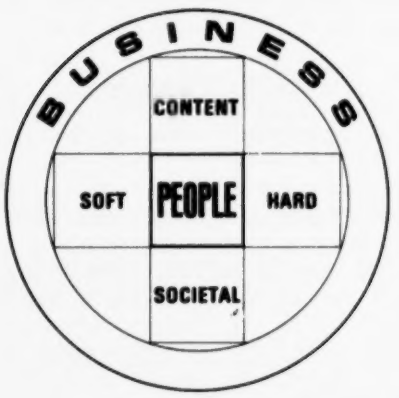
BUSINESS & TECHNICAL FACTORS

FIRST THOUGHT
SEPARATE

SECOND .... AND LASTING .... THOUGHT
INEXTRICABLY INTERRELATED



THE X FACES OF EVE

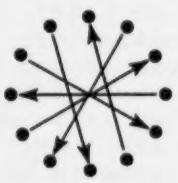


THE VARIOUS "WARES"

COMMUNICATIONS

WITHIN THE COMMUNICATIONS INDUSTRY

1 PUBLISHER
2 CUSTOMER'S DATA PROCESSOR
3 SYSTEMS ANALYST (& SYNTHESIZER)
4 SYSTEMS SYNTHESIZER
5 DATA PROCESSING PROGRAMMER
6 COMPOSITION PROGRAMMER
7 DATA INPUT PROCESSOR
8 COMPUTER PROCESSOR (S)
9 COMPOSITION PROCESSOR
10 PASTE-UP
11 PLATEMAKER
12 PRINTING, BINDING

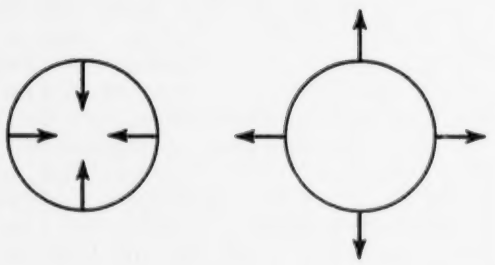


T's FIRST LAW

COMMUNICATION WITHIN
THE COMMUNICATIONS INDUSTRY

IS AT LEAST EQUALLY
AS IMPORTANT AS

COMMUNICATION OUTSIDE
THE COMMUNICATIONS INDUSTRY



platemaker and the printer and binder. Now there are 12. Portraying these as the 12 numerals of the clock, there will be at least one occasion upon which each one of these will want to talk with some one of the other and some of the things that are said are perhaps best expressed by red lines rather than by direct quotation, particularly when it has, shall we say, its inherent problems.

((T's First Law)) This leads to four laws. These are not so much like the laws of Newton as they are like the laws of Parkinson. The first of these is that there is some reason to believe that communications *within* the communications industry itself is at least equally as important as communications outside the communications industry. Many have told us how communications should be used for their human purpose, but there is, I think, need for more discussion within the industry that manufactures this product.

((T's Second Law)) The second is that the purpose of communication is to convey meaning. This you understand and subscribe to I'm sure, outside the communications industry---- the customer side of the communications process itself. But there is the equal need for this within the communications industry, and an understanding that *representation*, about which there is so much discussion, is really only the *vehicle* by which one does in fact convey *meaning*.

((T's Third Law)) The third is that the measure of effectiveness of communication is the *achieved* degree of understanding. Not: Is the system itself perfect? But rather: Are the users benefiting from it? There is a current illustration of this which you can look upon as something which is on the table. In New Orleans, or even Washington, it might be sodium chloride; in Helsinki it might be Strategic Arms Limitation Talks.

((T's Fourth Law)) The last of the four is that the greater the number of interfaces, and this is within the manufacturing process itself, the greater the *need for specification*. And the equation suggests that this need is geometric. You can call it ground rules, common sense, what have you. There must be understanding if there is to be a smooth flow in the production process.

((Business - Technical Who's Who)) If we pursue this a little more in the next chart, we will have our own Business and Technical Who's Who. Who has general systems responsibility? Has the publisher chosen to assume this role himself? Consciously or unconsciously? Has he asked the printer to do this? Does the printer understand that he's the general contractor? Who has partial systems responsibility for a data processing segment, for example, or a composition segment? Who is responsible for putting the entire mosaic together? So that when it is completed it will represent a picture that you will know and love. And does everyone understand the role of the interfaces in this

T's SECOND LAW

THE **PURPOSE** OF COMMUNICATION IS
TO CONVEY MEANING

REPRESENTATION IS ONLY
THE VEHICLE

T's THIRD LAW

THE **MEASURE-OF-EFFECTIVENESS**
OF COMMUNICATION

IS THE

ACHIEVED DEGREE OF UNDERSTANDING

ACHIEVED DEGREE OF UNDERSTANDING

SALT

T's FOURTH LAW

THE GREATER THE NUMBER
OF **INTERFACES**

THE GREATER THE NEED
FOR **SPECIFICATION**

$$S = (I)^n$$

BUSINESS – TECHNICAL

WHO'S WHO

WHO HAS:

GENERAL SYSTEMS RESPONSIBILITY ?

PARTIAL SYSTEMS RESPONSIBILITY ?

SYSTEMS INTEGRATION RESPONSIBILITY ?

INTERFACE UNDERSTANDING ?

process----in addition to understanding the over-all process itself? ((Yesterday/Today)) Paraphrasing again with regard to some well-known sayings to which engineers may have been more exposed than others, since they are known to be irreverent by nature:----It used to be: Yesterday we didn't even know what an engineer were; today we are one! Of course, the okay word of today is interface. So, if you are in this process---- you will know what it is to be an interface instead of to hear about one.

((End-Product Design/Analysis)) The end-product is the goal in every one of these processes. Whether you consider this to be a design approach or an analysis approach, the choice is not really significant in the sense that you can use what we are to discuss from either point of view. It is perhaps more conventionally looked at from the point of view of analysis because the given products have been existing printed products which one is trying to duplicate or to change in some describable manner. One way of looking at this is what might be called *situational analysis*. In the broad sense you can have what are structured numerical documents such as number tables, rate charts, things of that kind; structured linguistics; straight text, such as a book; illustrations within the text. And then there is the matter of form. Will this be a printed [illegible] a microform product? Or will it be prepared for, say, facsimile transmission? Within the fine structure of this there will be the matter of headings. What kind, how many different kinds? What kind of text in the body? What kind of text in the insets? What will the running heads be? And the ever-present matter of the 50-page book that is more difficult to program than the 40,000-page volume should not be forgotten!

B. Diversity of Product and Manufactured Form

((Product Diversity)) Many and diverse are the FORMS of communication which a system should accommodate. ((Chart Page Assembly Exhibit, Overlay Rolled Back)) While one steps beyond the physical form of photographic overlays and chain-printer pages, the concept of interlacing of data----fixed and variable----is an explicit requirement. ((Chart Page Assembly Exhibit, Overlay Flat)) (("War and Peace" in Less Than an Hour)) While one thinks beyond ILLUSTRATIVE COMPUTATION of "War and Peace" in less than an hour, ((The Long Short Cut)) or ILLUSTRATIVE ACHIEVEMENT, novels and other straight-text matter must be accommodated.

The following are examples which illustrate structured numerics, structured linguistics, straight text, and so forth, leading to transmitted images----a portion of the spectrum of desired accomplishment. ((USGPO: Job Size Approx. 36,000 Pages, Reversal Film and Printed Page)) As you all will recall, this was the first job which Jack Boyle put through the GPO. It was a nice 36,000-page job which made the propriety of his approach quite apparent. A reversal film leads to a plate and to a printed page such as is illustrated. The use is for a structured

YESTERDAY

WE DIDN'T KNOW

WHAT AN INTERFACE WERE!

TODAY

WE ARE ONE!

END-PRODUCT DESIGN/ANALYSIS

SITUATIONAL ANALYSIS:

BROAD

STRUCTURED NUMERICS
STRUCTURED LINGUISTICS
STRAIGHT TEXT
ILLUSTRATIONS
FORM ——— MICRO
FAX
EBR

FINE

HEADINGS	x	TYPES/KINDS
TEXT	y	TYPES/
PERIPHERAL TYPOGRAPHY	z	TYPES/

NUMBER & KIND vs PAGE VOLUME

numerical or structured alphanumerical type of document. ((Staten Island Telephone Directory Page)) This one, of course, represents Frank Weis' Staten Island Directory, the first large directory experiment in which telephone entries were made----the structured linguistic example, the PHOTAC predecessor to today's Project DIR/ECT. ((Later Telephone Directory Page)) ((Later Telephone Directory Page)) The last two are more recent samples as this work progresses.

((PART Survival and Unification----RCA Text Sample)) ((Chapter 11 THE FIRST PUNIC WAR----RCA Text Sample)) These are some early examples of straight text. ((COMPOSITION VARIANTS The NY Times Large-Type Weekly----Large-Type Books)) This illustrates variants in composition that you could acquire from the same original keyboarded input and which people who have poor eye-sight do, in fact, use and enjoy. ((Text)) This next series is a representation of RCA's combined text and illustration technique, which is now available in their equipment, showing the text, ((Image)) the illustration, ((Text and Image)) the two combining to make one image. ((RCA VIDEOCOMP 840 Flow Diagram)) and in this flow chart in the upper right, the microform which can be made in the same way----((Text and Image and Microform)) more clearly shown in this diagram. And any system must take advantage of this capability.

V. SYSTEM CONSIDERATIONS

A. Philosophy and Broad Concept

((System Considerations)) In the area of system considerations, ((Philosophical Environment)) the guidelines selected should be flexible and responsive to defined need. Reading from the text, one identifies the elements of policy and implementation.

((System Broad Concept)) If we step into what are the broad concepts of System X, in simplified form there are creation, copy handling, a typographic determination which has been separated out from the inputting process, a typographic implementation, and a proofing loop which has 2 roles: one for the content and the other for the typography. The key factor in here is that you can change your mind about the typography because there are separate inputs, as you will see, where you can change what you have selected as body text or what you have selected as the font for the heading of the first kind. When you have made up your mind that you have what you want, then you can put this out to printing and binding. You can go around this loop as few or as many times as you desire. ((System Implementation)) This is a one for one of implementation which shows the use of both high-speed and low-speed photocomposition lines because there will inevitably be front matter which you may choose to do by hand as contrasted to the major part of the text which you might like to do by machine.

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Chart No. 6
Sheet 1 of 1

4. PHILOSOPHICAL ENVIRONMENT

A. GUIDELINES

1. Policy

A standard interface should be created between customer and printer which:

a. Is NOT complex

b. Is NOT a function of what over-all typographical specification set may be selected

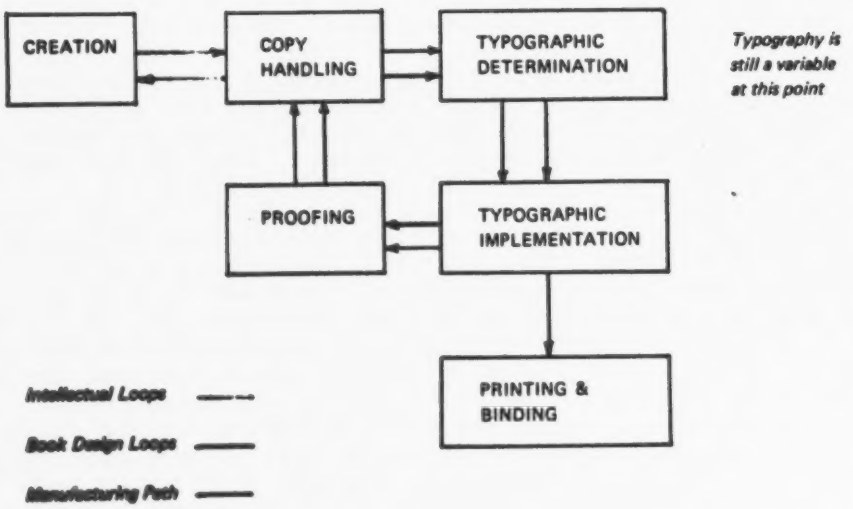
c. ALLOWS the customer to provide
   a. machine-readable copy,
   b. manuscript copy, or
   c. combinations including both

2. Implementation

An OPEN-ENDED language should be created which will allow simple addition of later items in the intellectual/editorial and typographic situation catalogs.

SYSTEM

BROAD CONCEPT



Typography is still a variable at this point

B. Over-all Structure

((Categories of Consideration)) The whole viewpoint of our discussion today is what you might call a *top-down view* based on what you want as an end product and how the whole process can be put together as a system. Recognition that in the methodology of communication as evidenced in the manufacturing process there will be *editorial situations and typographic situations.* And the suggestion that a problem-oriented language with a sufficiently high level of abstraction is desirable. What this means is: the level of abstraction that you would like is one which establishes the maximum degree of ease for those doing the input keyboarding. Do they have to deal with long strings of function codes, or do they have to deal with short strings of function codes? They inevitably must key in the content; so that's not a matter for discussion. It has only to do with the manner in which you set up the system to structure it for manufacturing execution.

((Mode of Communication)) The basic premise is to relate this to the editorial structure of the document and to use typography to strengthen those measuresof emphasis which the publisher would like to have, subject again and always to logical conditions. The over-all purpose is to insure that the publisher has at his disposal, and exercises, those *means of changing communication mode* which he desires. And he desires this because that's his *method of conveying meaning.*

((Content Stream--1)) The content stream must include the basic content and what have been called *change-of-mode identifiers.* These may relate to the editorial structure and they may relate to typography when typography is a measure of emphasis in the communication process. It does not mean typography in what you might call a housekeeping or regular sense.

((System X Interpreter)) Basically the structure of this approach is to put in the typographic parameters currently in effect through a table of specifications. In fact, the whole approach to this is based upon the *divorcement* of actual content keyboarding from typography----taking this into one set of specifications which will more nearly resemble the situation which implicitly or explicitly takes place today. Even if the publisher says: "Make it like the last 10 books," there still is an implicit specification. The content tape goes in as the other input. There will be the need for tape translation if you allow generality in tape codes. The System X interpreter, in effect, is a pre-conditioner which prepares this blended tape to go into any given composition program which you chooseto use, be it an RCA PAGE 1, a Harris Composition System, a Mergenthaler Master Typography Program, a PICA Data Systems Ultra-X Program, whatever program you have in mind. Lastly, you have an ouput device. The variability according to manufacturers indicated in the slide would suggest that your output module from any interpreter must relate to some specific piece of equipment, whereas your input need not. And there is, I think,great reason to do it that way. This is, in fact, the *"whole point."*

CATEGORIES OF CONSIDERATION

TOP-DOWN VIEW OF THE SYSTEM
The Manufactured Product

METHODOLOGY OF COMMUNICATION
Editorial Situations
Typographic Situations

PROBLEM-ORIENTED LANGUAGE
Level of abstraction sufficiently high

MODE OF COMMUNICATION

Relates to:

1. Position within the *INTELLECTUAL HIERARCHY* of the *CONTENT*

2. *TYPOGRAPHICALLY EFFECTED*
   - measures of emphasis
   - logical conditions

Purpose:

To insure *PROPER COMMUNICATION* of *INTENDED MEANING*

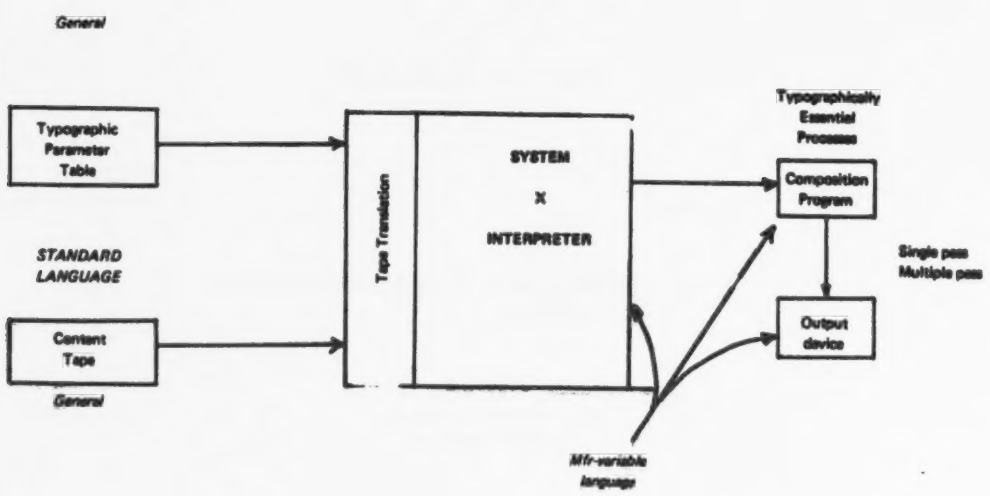
CONTENT STREAM

Must include:

BASIC CONTENT

CHANGE-OF-MODE IDENTIFIERS

- Hierarchical
- Typographic

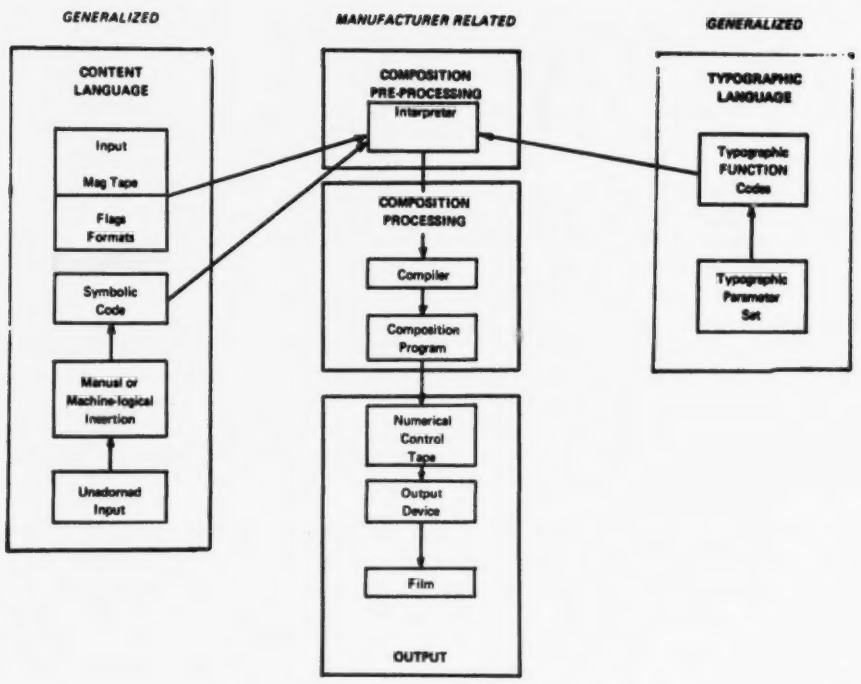


((System X Interpreter--Detailed)) In a more detailed sense, you have your content language and these are generalized structures. In a tape-derived system one must have flags or structured formats in order to exist from a data processing point of view In a manuscript situation one has what one might loosely call unadorned input from the point of view of typography. It does have its editorial structure. So that one needs to insert, in addition to content, the change-of-mode identifiers that we have talked about and then one has in effect a symbolic code mixed with the content and one is ready to go into the pre-processing. Similarily, the typographic specifications go in in that particular language, which again is generalized from the point of view of being simplified rather than complicated. After the pre-processing one goes through the regular composition program and goes out through some kind of output device. Effectively, this is a numerically controlled machine, no matter what you call it, who's model it is. The output is film or paper as suits your fancy or in microfilm.

((Page Design)) In page design, as we shall see when we look at the more detailed pages, there is the concept of dynamic dimensioning, which means that you can go through a whole book in the computer, with suitable escape valves if you hang, but the idea is to keep on going and to allow the book to generate rather than just a line to generate. And the dimensions of each class of text considered from an editorial point of view are independent. They are not interrelated in the logic of typographic implementation although they may be in the aesthetics of typographic design.

((Dimensioning)) Dimensioning is approached from the point of view that the horizontal dimensions are structured according to class and the vertical dimensions have to do basically with the print zone----all with such other constraints as you impose regarding the interrelationship of different classes e.g., a heading to its body text.

((Typographic Parameter Table)) The Typographic Parameter Table specifies what the basic parameters are for any given class. Here illustrated are Classes 1 to 6, the measure varying in this particular case not at all, each being 24 picas wide, and a given set of faces and of related factors which do vary----the usual things that you see with regard to the specification of parameters for given portions of the text. This does not deal with the conditional-logic elements which we shall get into. What this allows you to do is to put in a content stream which has simplified coding which will,by the pre-processing, be itself exploded. You've heard much of data explosion with regard to the use of magnetic-tape-stored data which is used in 4 or 5 different ways. This is the function-code explosion. This was the kind of page that was looked at in the course of this particular example, taken from our discussions in Maryland.



PAGE DESIGN

DYNAMIC DIMENSIONING

CLASS DIMENSIONS INDEPENDENT

DIMENSIONING

1. HORIZONTAL DIMENSIONS
   - *Structured*
     - content class
     - special typographic vehicle

2. VERTICAL DIMENSIONS
   - *Physical Constraints*
     - allowable zones
   - *Communications Mode Constraints*
     - logical rules imposed by
       - (1) class
       - (2) class relationship
       - (3) special typographic vehicle

TYPOGRAPHIC PARAMETER TABLE

	Units	C1	C2	C3	C4	C5	C6
Measure	Picas	24	24	24	24	24	24
Face	Code Table	5	5	5	6	5	9
Size	Points	10	24	8	8	8	10
Indention) Primary) (Para. 1st line)	Points	0	0	0	0	0	10
) Secondary	Points	0	0	0	0	0	0
Word Space Max.	Points	5	8	4	4	4	6
Word Space Min.	Points	5	8	4	4	4	4
Line Mode	Code	FL	FL	FL	FL	FL	HJ
Pre-Text Space	Points	20	38	28	9	14	28
Baseline to baseline within the class	Points	10	28	9	9	9	11

((Content Stream--2)) This example illustrates minimal coding which is related to the editorial hierachy and to typographic emphasis. For example, the (13) is an identification of job and operator; the (7) indicates non-justifiable horizontal space; and the (3) indicates a forced short-line break. ((Chapter 2 Problems of Computer Typesetting----page image)) This coding leads, via programs, to the finished page image----a page sample selected from Professor Duncan's session at the London Conference.

C. Functional Capabilities

1. General

((Functional Capabilities)) As to functional capabilities, ((Context)) let us look at this from the point of view of context, editorial and typographic. You have seen these described as individual elements, and there is a combination which is both editorial and typographic where the interrelationship of the basic content (the data of the data base), whether it be a manuscript or some other form, and the content entry in terms of typography have this relationship with regard to the physical expression in the image. You will later see in a sample directory that the simple example of this is the telltale. You don't know what the first entry and last entry are until the process has in fact taken place.

((Fundamental Decisions)) The fundamental decisions that you have to make as a potential practitioner are to select programming solutions which will be either particularized or generalized or perhaps some halfway house in between. And therein will hang some large dollar bills. There is not to my knowledge extant today any completely generalized system and this is the reason for pursuing the vision of System X. There are many particularized solutions. You can do a particular book in repetitive editions. You can pay for the programming to have that done and that will be less expensive than a generalized solution, but you won't be able to use it for anything else. A lot will hinge upon your approach to pagination---- do you want to do this manually with paste-up or do you want to have it flow-generated in the machine, the latter, of course, being clearly more expensive, if the generalized capability does not exist.

Two slides illustrate types of composition which are inherent in your consideration of how much you want to put into the computer. The first one ((Line Composition)) on line composition is, of course, the line-by-line generation, which many of these machines, with the exception of the 1010, really provide. They are all line-casters with the exception of the 1010 and the RCA window feature. But there is a big difference in how your thought processes go. It may put down line-for-line, but are you going to do anything else besides line-for-line casting.

CONTENT STREAM

(13;C1)SCHAPTER(7)U2
H N

(C2)SPUROBLEMS(3)OFSCUOMPUTERSTUYPESSTTING
H N SH N SH N

(C3)SCUILDMAN

(C4)SMURJSC4JDUUNCAN
H N SH S S N

(C3)SSUPEAKERS
H N

(C4)SMURSR.FFUULLICK
H N SH S S N

..

..

..

..

(C4)SJRJSHJGALLNER
H N SH S S N

(C6)SCHAIRMAN:(7)SAVEARECODING/ ....
H HNS S S

CHAPTER 2

Problems of Computer Typesetting

Chairman
Mr C J Duncan

Speakers
Mr R F Fullick
Mr R Boyd
Mr D Macintyre
Mr E J Coates
Mr J M Johnston
Mr H G Maher

CHAIRMAN: We are going to start, first of all, on books and solid text. I have a vested interest in this but I am not going to say anything until I have another go at you tomorrow.

The first speaker is going to be Mr. Fullick. You will have read his autobiography in the conference booklet so I do not propose to do anything more than to introduce him to you and ask him to open the proceedings.

Problems of a book printer

Mr. R. F. FULLICK (Hazell Sun Ltd): In this two and a half days of theory and typographical philosophy upon which we have embarked, I at least feel myself fortunate in being able to state an incontrovertible fact: that is, it is extremely difficult for any speaker to follow Mr. Duncan!

One does not have to be long involved in computer typesetting to realize that it is somewhat like climbing a hill: when one thinks one has got to the top, one realizes that it is just a false crest, and all it does is to reveal another uphill area in front of one. This is certainly how I have felt in the seat or so during which I have been engaged in this.

In this period, during which interest in computer typesetting has grossing, there have been points of view put forward questioning the need or desirability of this line of technological research in the printing industry. Fears have been expressed for the position and future of the people who make up the industry, in all its diversity, whether they be master printers or workpeople."

CONTEXT

EDITORIAL

TYPOGRAPHIC

EDITORIAL/TYPOGRAPHIC

THE INTERRELATIONSHIP OF

BASIC CONTENT (DATA)

AND CONTENT ENTRY (TYPOGRAPHY)

FOR ANY ONE LINE

FUNDAMENTAL DECISIONS

BUSINESS & TECHNICAL

PROGRAMMING SOLUTIONS

PARTICULARIZED

GENERALIZED

PAGINATION

MANUAL PASTE-UP

MACHINE FLOW-GENERATED

INPUT FLAGS

CHANGE OF:

STATE

COMMUNICATIONS MODE

INPUT FLAGS

GENERIC UNIQUE

—— TO A GIVEN JOB

SHIFT

UNSHIFT

WORD SPACE

END OF PARAGRAPH

SELECTIVE EMPHASIS

BOLD

ITALIC

UNDERSCORE

CHANGE OF POINT SIZE

SPECIFIABLE LATER

DELIMITERS

DO NOT BREAK

PHRASE

LINE

TEXT BLOCK

That's the clear question----in the manufacturing process. ((Area Composition)) In the 1010 for example, or in the window of the RCA, if you wanted to interlace the structure of a table, which might be repetitive from edition to edition, and newly generated numerical data, here illustrated within the frame, you could do this all without any page movement. In the other machines and in those you would have to have accommodated this in your program. *There is no escape from symbolic manipulation before photographic exposure.*

((Confessions of an Ex-Stripper)) Just what should a program do? Here are the razor and rule which symbolize the process. And however you do this, you have certain constituent elements which you use as the basic ingredients of what one might call the mosaic: running heads and feet, some ads, and the basic content. This slide represents ((Full Page)) a drug-directory page that you want to generate. You start putting things on ((8-Slide Paste-Up Series)) and the page builds before your eyes. And hopefully doesn't go down in flames. Then when you're all done and you know what the first and last entries are you can put in the telltales, and you have your completed page. That is really what you have to do, whether you do it manually or by machine.

2. Input

((Input Flags)) The input flags you will want to utilize in order to identify what you might call changes-of-state, what have been called in here *changes-of-communication-mode*. These really are the decision of the publisher, or the author, in the course of his process of determining how he wants to convey meaning. And the role of the printer or the typographer is to give *imagery* to his selection.

((Input Flags--Detailed)) If we look at what these are in a little more detail, there will be certain generic codes that you will need in any job. And this is oriented towards the book text, because it's easier to discuss from that point of view. You will need a shift code, an unshift code, a word space, an end-of-paragraph, for example. For selective emphasis you can indicate that you want bold. You won't know what bold it is at this point in time. You will specify that separately, or call upon others to specify it separately, but it will be a bold that is related to that particular class of text in which this input flag appears. And this is really the whole name of the game. You're specifying what you want as a device for emphasis, but you are not specifying an exact manufacturing technique. You're doing that separately. You might choose to italicize, to underscore, to change the point size, or say, "I haven't made my mind up, but I just know that I want to do something here and I'll come back and tell you some sunny day." But you do have to have the point identified and that is really all that is required. You will need delimiters and it doesn't matter whether you're thinking of RCA's left-and right-hand delimiters or Teatron's @ sign and a comma, or anything else of anyone else's choosing. They must exist; they must be unique; they must never be used in content, unless you put in

structure variants. You will also in some cases want some do-not-break instructions in here, which in essence have to do with your train of thought but in reality will specify as "don't break this phrase," or "don't break this line," or "don't break this text block." And, in the illustration case, "don't put half my illustration in one column and half in the other, or on another page."

((Input Delimiters)) The next chart will suggest to you that you can draw up a long list, even expressed generically, which gives you all the more reason to do it generically than specifically. You will see these same things identified as the running state changes; e.g., the selective emphasis items or forced end-of-page. We talked about do-not-break. There are occasions when you want a forced short-line-break, as you saw in the previous content stream. And this isn't because the typographer wants it this way necessarily. It's because the author or the publisher wants it this way as a *vehicle for communication*. So the system that is created must respond to that need and this is, therefore, generically required. Note also, such logical requirements as the two kinds of "call" ----typographic and intellectual.

((Input Text Stream)) In the next one, this is an input text stream similar to the one you saw in a preceding slide. It re-emphasizes the point that you will minimize the amount of input keyboarding, that you will be able to use this same input tape to exercise different kinds of typography without ever changing the input tape itself. You will only change the specification of typographic parameters or logical conditions.

3. Meaning and Representation

((Codes and Structures)) You will by now have concluded that the thrust of these remarks has to do with *structure*; that, in this coding, the significant thing is the structure; that you must be consistent within the action definition which you apply to any particular code. You have the issue of meaning vs. representation and the emphasis is on consistency of meaning, a simplification we have touched upon, and the fact that, by different choices of parameters in the parameter table when one goes through the pre-processor he can exercise typographic flexibility or design change without re-keyboarding. To concentrate on this issue of meaning and representation there are two slides. This is what people often think about when they think about standardizing codes. ((Bell Laboratories 9-Level Code)) The first is a Bell code, and ((Linotron 15-Level Code)) this is a Linotron code. ((Meaning & Representation--1)) But the really significant thing is that you want to convey meaning. *It's the fact that it's an A that's important.* As far as bit configuration is concerned, what should it be. It would be easier if there were a worldwide standard, there can be absolutely no doubt about that, but for the purposes of a system which must respond to the facts of life and the needs of the publisher, the significant thing is that the code should be known. In this circumstance that we're describing, the publisher might do his

COMPOSITION SYSTEM WORK SESSION NO. 2
W. W. TUNNICLIFFE, CHAIRMAN

INPUT DELINEATED

A. Fundamentally content related with identification of changes of typographic state

1. Initial typographic parameter set

2. Change typographic parameter set

   a. Running-state change
      (Content is not necessarily contiguously related in expansion work)
   b. Selective emphasis
      (1) Bold
      (2) Italic
      (3) Underscore
      (4) Change point size
      (5) Specifiable
      (6) Generic code

3. Forced short-line break (mandatory phrase break)

4. Forced end of page
   (Both content-related and typography-related in the sense of a revision zone, which must match to preceding and following editorial content and must match to preceding and following typographic structure.)

5. Illustration call

   a. Call
      (Typographically-related call; NOT the reader's call that appears in the normal text)
   b. Choice of illustration characteristics
   c. Choice caption text

6. Non-justifiable vertical space

   a. Use/not use per page position

7. Non-justifiable horizontal space

COMPOSITION SYSTEM WORK SESSION NO. 2
W. W. TUNNICLIFFE, CHAIRMAN

INPUT TEXT STREAM

(13;C1)$^{S}_{M}$CHAPTER(2)$^{U}_{S}$1

(C2)$^{S}_{M}$I$^{U}_{S}$NTRODUCTORY$^{MS}_{SM}$S$^{U}_{S}$ESSION

(C2)$^{S}_{M}$P$^{U}_{S}$ROBLEMS(3)OF$^{MS}_{SM}$C$^{U}_{S}$OMPUTERIZED$^{MS}_{SM}$T$^{U}_{S}$YPESETTING

(C3)$^{S}_{M}$C$^{U}_{S}$HAIRMAN

(C4)$^{S}_{M}$W$^{U}_{S}$H$^{MS}_{SM}$O$^{M}_{S}$W$^{U}_{S}$A$^{U}_{S}$LLEN

(C3)$^{S}_{M}$S$^{U}_{S}$PEAKERS

(C4)$^{S}_{M}$W$^{U}_{S}$H$^{MS}_{SM}$O$^{M}_{S}$J$^{M}_{S}$O$^{U}_{S}$UNCAN(3)

(C4)$^{S}_{M}$D$^{U}_{S}$H$^{MS}_{SM}$O$^{M}_{S}$J$^{M}_{S}$O$^{M}_{S}$E$^{U}_{S}$DWARDS

CODES & STRUCTURES

THE STRUCTURE IS THE THING

....CONSISTENCY OF
ACTION DEFINITION

MEANING vs. REPRESENTATION

SIMPLIFIED ....at input

VARIABLE INTERPRETATION ALLOWS:

TYPOGRAPHIC FLEXIBILITY
DESIGN CHANGE
....**without** re-Keyboarding

MEANING & REPRESENTATION 1

BIT CONFIGURATION

A

WHAT SHOULD IT BE?

KNOWN
CONSISTENT
at least for one job

MEANING & REPRESENTATION 2

STANDARDS OF MEANING

CONTENT & **COMMUNICATIONS EMPHASIS**

RICE

TYPOGRAPHIC IMPLEMENTATION STRUCTURE

SYSTEM X

USE

ASCII } INFORMATION INTERCHANGE
RICE }

SYMBOLIC REPRESENTATION OF
CONTENT
EMPHASIS ⇦

SYSTEM X INFORMATION INTERCHANGE

SYMBOLIC REPRESENTATION OF
CONTENT
IMAGERY ⇦

BOTH are INTERFACE LANGUAGES

own keyboarding. He might have it done by a third party. The printer might do it. You could be faced with getting some input in which you don't know the codes. So, clearly, that's one of the first things that you have. The second thing is that it must be consistent, at least for that one job. And that's the reason for the tape translator at the head end of the block diagram. You don't really care if it varies from job to job. But an A must be an A throughout this particular job, or job segment. And the work that Dr. Duncan is doing in standardizing may make this all a little more tractable for you.

((Meaning & Representation--2)) As to standards----*the standards must be those of meaning.* Many of you may have read the article by Mr. Rice in the Journal of Typographic Research. His article has to do with content and what I call communications emphasis. And I think it is generally consistent with the approach of System X in that System X concentrates on typographic implementation of the publisher's desires----*releases selected imagery.* The publisher's desires really are those that are expressed in this input tape. And Mr. Rice's approach, it seems to me, is a vehicle for specifying what he desires and not so much the interpretation of this into practical----I won't say practical but rather----into physical form, physical images. ((Engineer and Manager----each with a different airplane in his mind's eye, and text: What managers cannot understand they usually will not approve----and what they do not approve the engineer cannot accomplish.)) If you wonder why I concentrate so much on meaning, this will give you a clue. Since it may not be readable, I will read it: "What managers cannot understand they usually will not approve. And what they do not approve the engineer cannot accomplish." This truism is pervasive in this whole process, not only in the economic justification.

((Use)) Let us look at the use within these two areas that we have been touching upon. In the case of ASCII or Mr. Rice's article, each deals with information interchange in which the symbolic representation refers to content and to emphasis. System X, if you like, is information interchange also. It is the symbolic representation of content and selected imagery. Both of these, in essence, are *interface languages.* They are intended to go between processes at the very least and in some likelihood between people or different companies, as the case may be. If there is consistency and standardization of meaning, then these will go forth.

4. Paging

((Page Geometry)) In the area of page geometry---- these are intended to be one-time graphically oriented definitions of what the total print area should be and of what the subordinate print areas may be, where you want your rules----in a cartesian mode of expression of source and destination. They constitute in essence the total allowable set of areas in which you may cast type of any kind. They may never all be used simultaneously on one page, but each will have been used at least once in the course of the whole document.

PAGE GEOMETRY

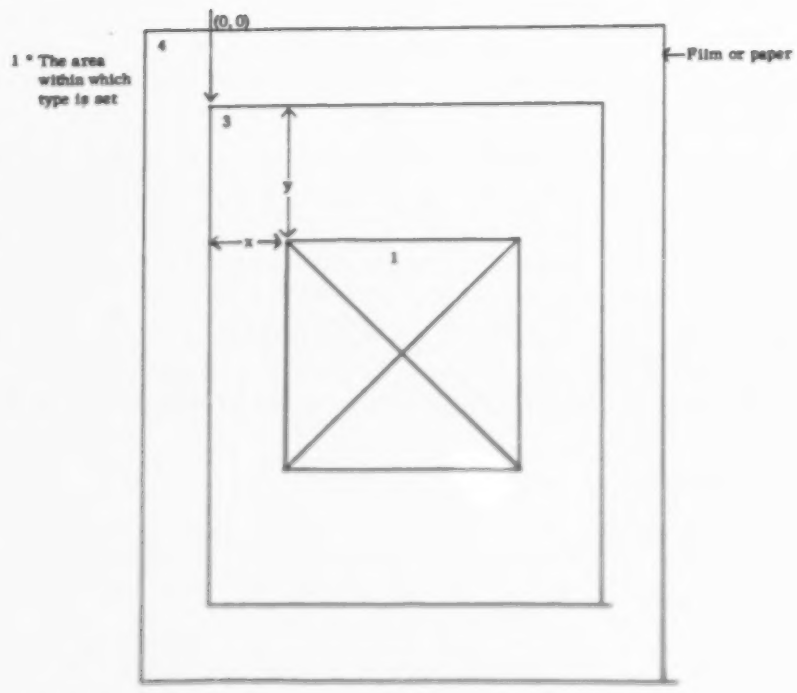
ONE-TIME, GRAPHIC DEFINITIONS OF:

TOTAL PRINT AREA
SUBORDINATE PRINT AREAS
RULES / CARTESIAN

THE TOTAL ALLOWABLE SET

COMPOSITION SYSTEM WORK SESSION NO. 2
W. W. TUNNICLIFFE, CHAIRMAN

BASIC DIMENSIONING



PAGE COMPOSITION FACTORS

1. Basic dimensioning
2. Alternating page design (one/two)

((Basic Dimensioning---1)) If we look at what this means in somewhat greater detail in the next series of charts, there are the conventional factors of page dimensioning, in terms of what does the publisher want in terms of the over-all print area on the page. Then there are the more mechanical and more detailed steps which you must take in specification as illustrated in the following charts. ((Right Page Design)) This illustrates, for example, where Class 1 text may fall and think again of the London proceedings on typesetting; where Class 2 text may fall; and where Class 3 text may fall. And so forth. They cannot fall in any other pattern. For example, C4 text could never fall to the left or the right of that indicated area. And the message of these diagrams ((Page Layout Sheet 36)) is that everything must be specified if everything is to be processed automatically. *There is no escape from specification.* ((Basic Dimensioning--2)) This slide begins to suggest the first step in what you might call the *dynamic dimensioning* with a running dimensioning where the emphasis of these classes has been on horizontal. And now you begin to see this suggestion of the form that it's going to be running through; where a left-hand page will float; where a right-hand page will float; both with respect to the running edge of the paper, going through the composition device itself. ((Typographic Parameters)) This slide illustrates the source/destination specification of rules as a part of this whole business of page-dimensioning and class-of-text specification. You will want to have it set up in essence so that for an allowable page structure you can specify the source, destination, and weight of any particular rule that you want to generate. And you don't really want to concern yourself with anything else.

5. Typographic Parameters

((Entries in Typographic Parameter Table)) The next one is the parameter table that you have seen illustrated previously, where in essence you would start with a structured piece of paper and you would fill in the numbers. This would constitute the *decision of specification* that you as a publisher, or you as a printer, or you as a new-breed processor would make if the publisher asked you to do this for him.

6. Explosions

((Explosions, Kinds of)) There have been several kinds of explosions, discussed and in fact. The ones that we're concerned with are those that deal with data and function codes. The data you are quite familiar with in terms of multiplicity of use----everything from the Electronic Buyer's Guide on down. The function-code explosion is a technique that is used in part by some of the programs that are available today and is inherent in the whole process that is projected for System X.

((Runs)) The purpose of these explosions is to allow you to make runs to do the work instead of having people do the work in the sense of accuracy, minimizing, in fact eliminating, the proofreading requirement, in the character-for-character sense. In the cases of straight-text and structured-data, both

Computer

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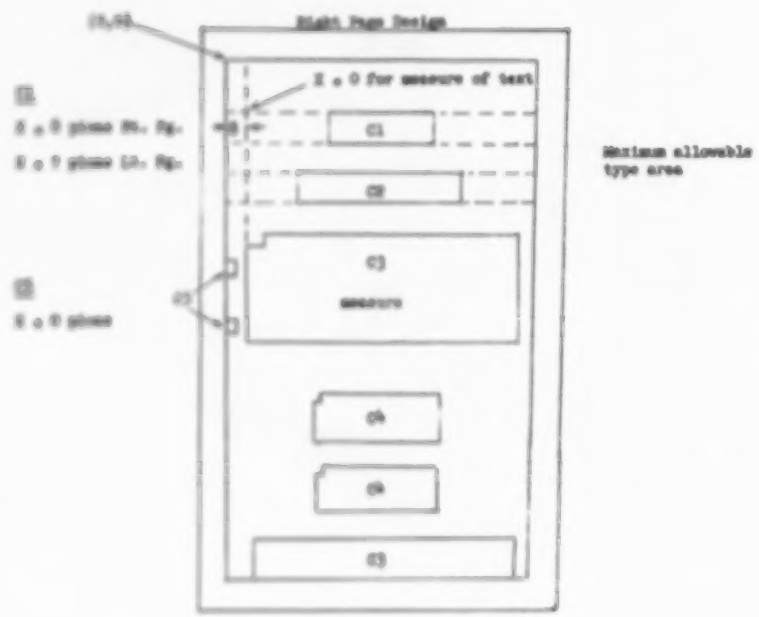
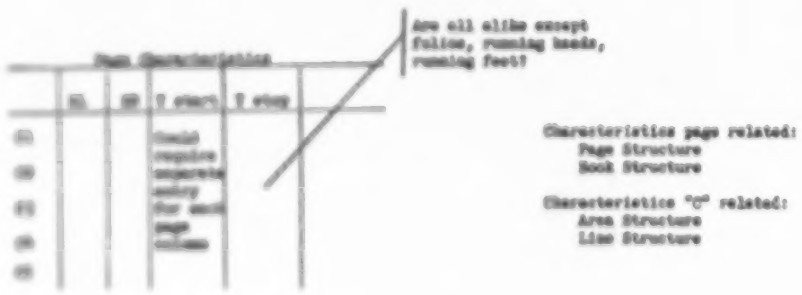
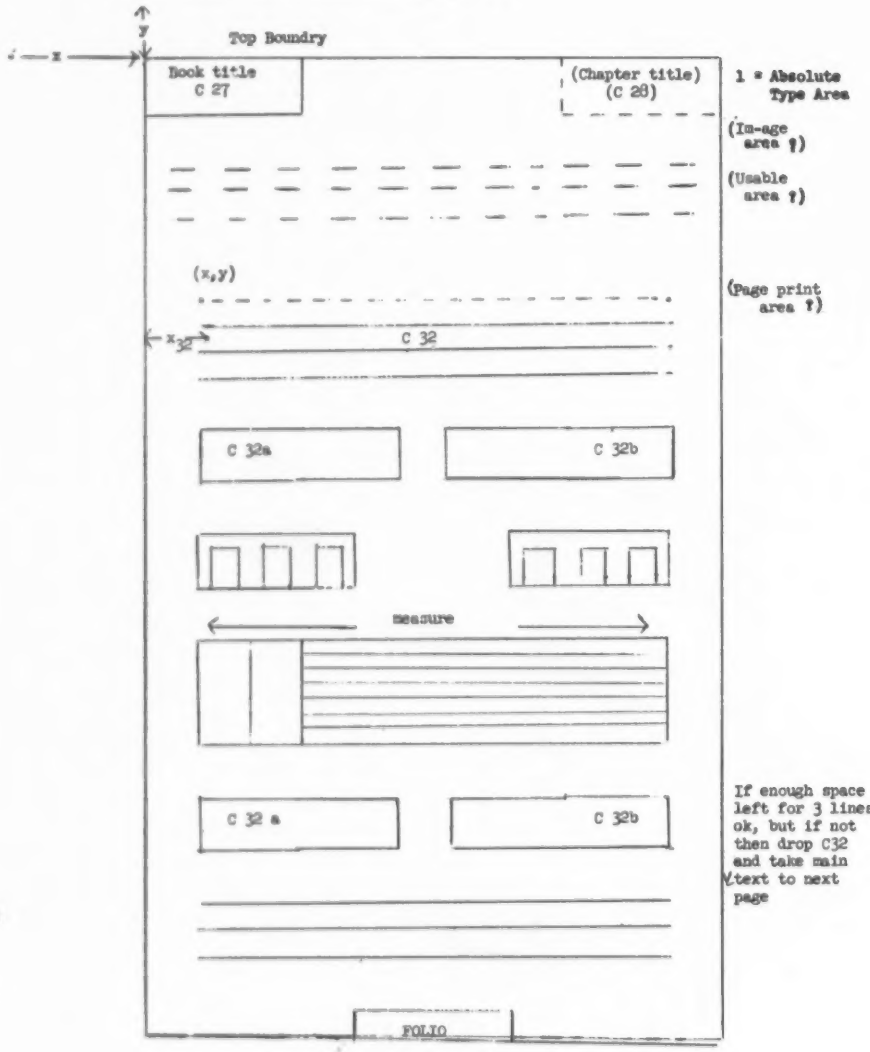


Maximum allowable type area



COMPOSITION SYSTEM WORK SESSION NO. 2



If enough space left for 3 lines, ok, but if not then drop C32 and take main text to next page

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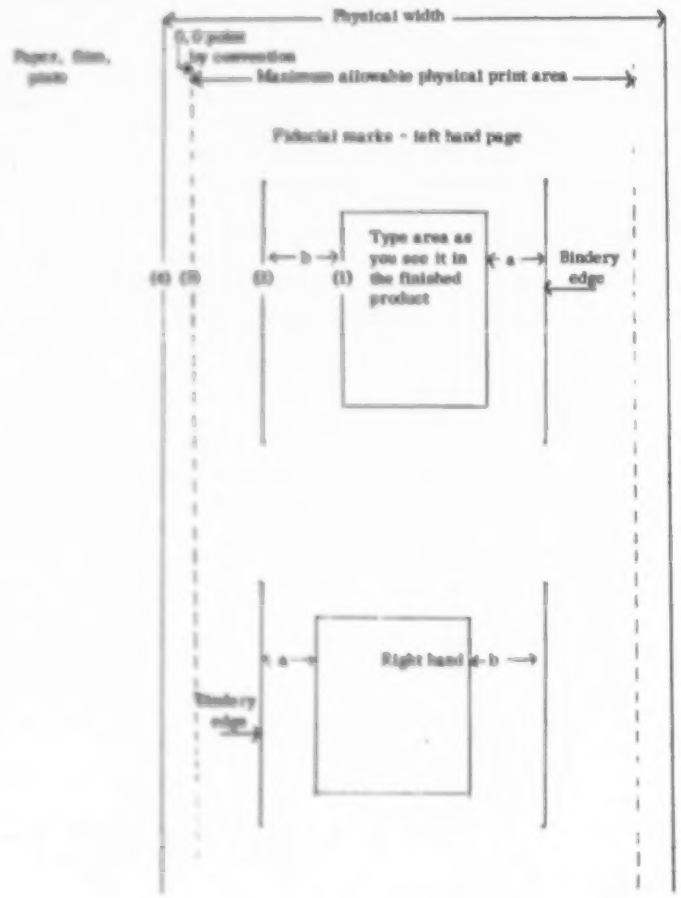
BASIC DIMENSIONING



COMPOSITION SYSTEM WORK SESSION NO. 2
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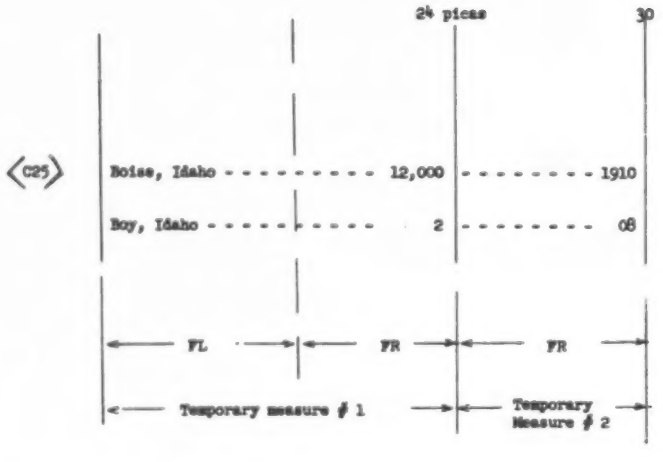
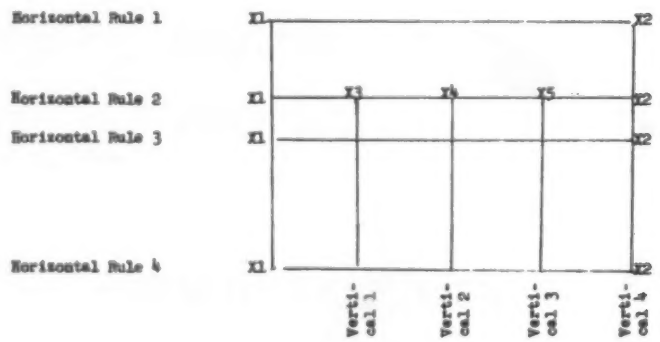
TYPOGRAPHIC PARAMETERS





Computer

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ENTERED IN TYPOGRAPHIC PARAMETER TABLE *

	Units **	C1	C2	C3	C4	C5	C6
Measure	Picas	24	24	24	24	24	24
Word	Code Units	5	5	5	6	5	9
Space	Points	10	24	8	8	8	10
Leading: Minimum (Slug Line)	Points	0	0	0	0	0	10
Leading: Incremental	Points	0	0	0	0	0	0
Quad Space Min.	Points	5	8	4	4	4	6
Quad Space Min.	Points	5	8	4	4	4	4
Line Mode	Code	FL	FL	FL	FL	FL	RJ
Em-Dash Space	Points	20	36	28	9	14	28
Function to Function within the Line	Points	10	28	9	9	9	11

* Across Load and Unit

** Could be given, Inches, Points, Ems, etc.

EXPLOSIONS, KINDS OF

DATA

FUNCTION CODES

RUNS

STRAIGHT TEXT

STRUCTURED

BOTH

EDITORIAL & DATA MANIPULATION

CODE EXPLOSION

DATA EXPLOSION
EDIT INSERTION

BOTH

COMPOSITION/COMPUTER

COMPOSITION/PHOTO

of these will require editorial and data manipulation in the publisher's sense until he has what you might loosely call clean tape. And some people who are in fact publishers, but don't know it, sometimes give you tapes which make you quite sensitive to their cleanliness. Data processors are not necessarily used to being publishers and they do not necessarily stress the accuracy of content, the uniformity and consistency of character expression, that publishers do. In the structured-data case you will have data explosion which will occur before your typography. Then the comparable elements in the straight-text and structured-data situations are code explosions for your straight-text and edit insertion for your magnetic tape or exploded tape. Then both will go through symbolic composition runs in the computer and physical composition runs in the photocomposition device.

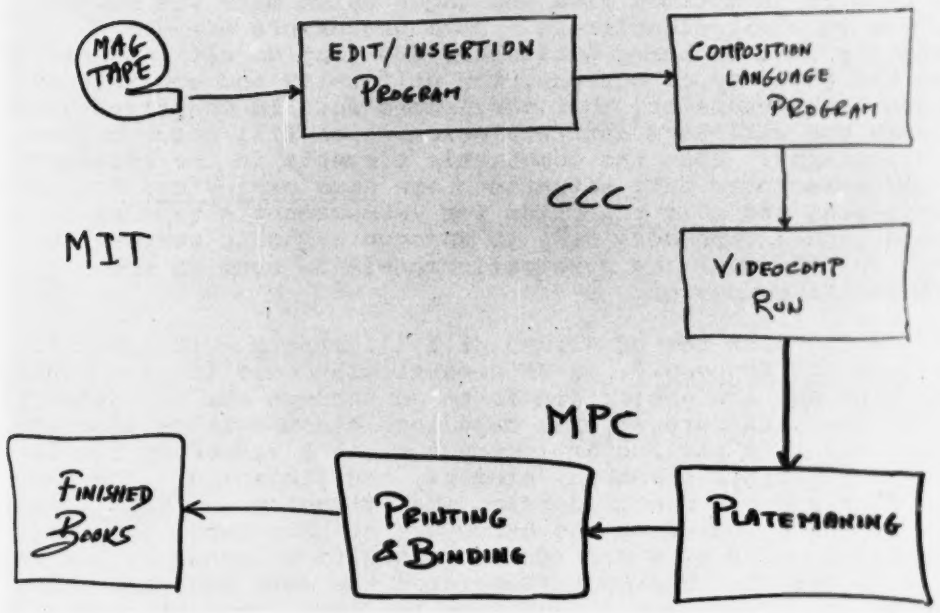
The next set of slides will illustrate edit insertion. ((The Over-All Process)) In this particular case it is a magnetic-stored tape and the whole idea is to go through the edit insertion run from the structure of that tape into a composition language program. In this particular instance it is a VideoComp run leading to platemaking, printing, binding, and finishing. The magnetic tape stores a man's name, address, and extension. ((Edit Insertion)) In the edit run, based on the structure of that tape, one inserts the function codes of a particular composition language. In this case it is PAGE 1. The red illustrates how many function codes are going in. The black illustrates the basic content string of characters. The green in the third bank down illustrates the further expansion of the PAGE 1 function codes into the numerical control codes that are necessary to drive the particular photocomposition device. In the VideoComp run itself, all one gets out, hopefully, is the content.

((Edited 01 Code/Job 111 (Corect Sheet))) This just illustrates the checking of the content stream and of the insertion of function codes actually taking place. ((Ashworth to Barry)) This is the typographic finished product, with the typographic emphasis applied in terms of the bold font and the basic page geometry. ((Whole Page Showing Housekeeping "Surround")) This illustrates the fact that one can put on, outside the area to be printed, such control information as he may desire of either geometrical nature or informational nature.

7. Dynamic Dimensioning

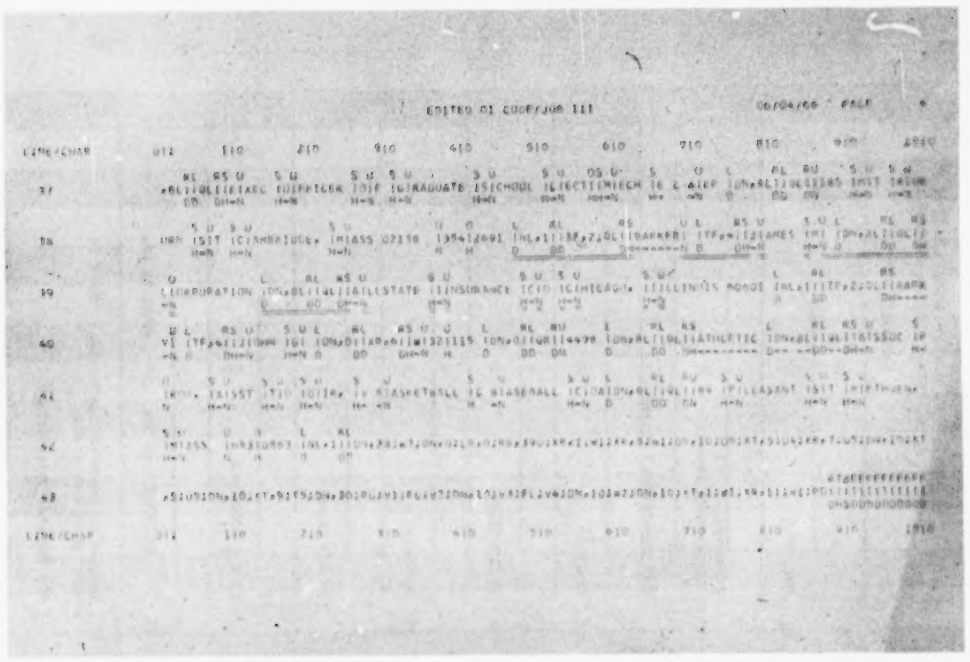
((System Flow Chart 84)) If we step back to the charts---- this illustrates again the fact that you put your content in, your typographic parameters in; you then go through an analysis or translation phase and through a composition processor into the output device. ((Composition)) You receive from this a structure which is that of the sample page we've been dealing with and you do in fact receive the spacing that you have specified by putting in your parameter tables.

The Over-all Process



Edit Insertion

Code		
1	MAG TAPE	ADELMAN, GEORGE.....280 NEWTON.... 5838
2	EDIT RUN	[TF,2;QL] S H ADELMAN U N [TF,4] S H G U N EORGE [DN,Ø][XR,4] U N 280 S H N U N EWTON [DN,Ø][QR] U N 5838
3	COMPOSITION RUN	ADELMAN □G□EORGE 280 □N□EWTON 5838
3	VIDEOCOMP RUN	ADELMAN George 280 Newton 5838



ASHWORTH Robert K N42-105 3858
4765
ADMINIS Admin Assistant, Graphic Arts
62 Bonair St Somerville, Mass 623-1620

AUSTIN James M E19-356 2102
54-1610 2287
METEOR Assoc Prof, Director Of The Summer Session
6 Wood St Concord, Mass 369-3025

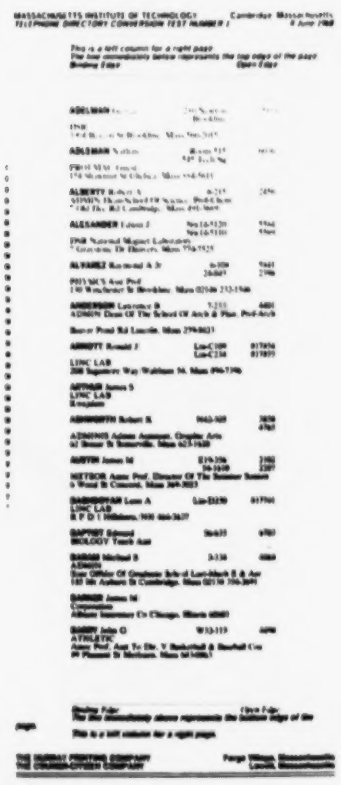
BAGHDOYAN Leon A Lin-D250 817741
LINC LAB
R F D 1 Hillsboro, NH 464-5637

BAPTIST Edward 56-635 6703
BIOLOGY Teach Asst

BARAM Michael S 3-134 4868
ADMIN
Exec Officer Of Graduate School Lect-Mech E & Aer
185 Mt Auburn St Cambridge, Mass 02138 354-2691

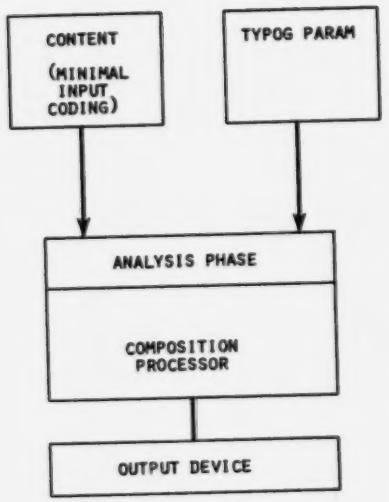
BARKER James M
Corporation
Allstate Insurance Co Chicago, Illinois 60601

BARRY John G W32-115 4498
ATHLETIC
Assoc Prof, Asst To Dir, V Basketball & Baseball Cos
89 Pleasant St Methuen, Mass 683-0863



COMPOSITION SYSTEM WORK SYSTEM NO. 2
W. W. TUNNICLIFFE, CHAIRMAN

SYSTEM FLOW CHART #4



COMPOSITION SYSTEM WORK SESSION NO. 2
W. W. TUNNICLIFFE, CHAIRMAN

COMPOSITION

C1 CHAPTER 1

C2 (Problems) Introductory Session

(of Computerised Typesetting)

C3 Chairman

C4 Mr G S Allen

C5 Speakers

C4 (Mr C J Duncan / Dr D G B Edwards)

C6 CHAIRMAN: We are about to hear

subject of Computer Typesetting. There is working in this field.

Why Computer Typesetting?

Mr. C. J. Duncan (New Castle University): I task this morning with considerable

((Dynamic Dimensioning--1)) In this approach of dynamic dimensioning the parameter tables have dealt with what you might call *intra*-class characteristics, the characteristics which pertain to one kind of text. It is basically *width-oriented*. With regard to conditional logic these relate to *inter*-class characteristics and are more *depth-oriented* geometry. There are housekeeping requirements of 2 kinds. The rudimentary of right-and left-hand pages, the page number, things of that kind. And the more involved, which are, say, rules with regard to how many lines of body text must occur after a given class of heading at the end of the page. ((Dynamic Dimensioning--2)) This illustrates the running of the dimensioning, in the sense of each of these classes of text occurring in its particular position, filling, and the fact that you must specify minimum and optimum page ending points----and that the more latitude that you structure in here the less your probability of a page-hang will be. You must have some kind of an escape structure because you cannot, presumably, anticipate each single occurrence that will take place in each document that you process. This is a system which will start out at a given level and will grow as you encounter the circumstances which cause it to hang. The area for exercise of typographic ingenuity, of logical ingenuity, is in setting up the logical constraints for giving the typographic expression latitude or giving it escape. It will take some creative expression.

8. Conditional Logic

((Conditional Logic--1)) If we look at conditional logic, the levels of specification and application will be, as just suggested, in part by the publisher or customer and in part by the publisher's manufacturer. The publisher's manufacturer must get into this right down to the nuts and bolts level. The publisher may or may not. The publisher can specify in broad or narrow terms and then let the printer execute the given desires. If a particular question comes up, an expression of stylistic choice can be obtained from the publisher. ((Conditional Logic--2)) The purpose of the conditional logic is to *establish flexibility within a regimented page geometry* so that you will not hang every time you would if you did this strictly by the numbers that you have specified in the parameter table, which is the more likely circumstance. It is *permissiveness in terms of typographic expression and in terms of logical expression*. It will allow you to finish the "book-pass".

((Conditional Logic - Illustrative Example 1)) Illustrative examples of conditional logic in simplified form are shown in these next 2 charts. Take the directory page that we put together in the sequential series of slides. An ad "call" might occur in the midst of a run of individual directory listings. It might start at a point where its specified length is going to exceed the depth allowed for the page. So one of the *conditional logic features*,the IF statements that you must put down, implicitly or explicitly, independent of any computer program is *what to do*. These features must be specified from the point of view of the user. If such and

DYNAMIC DIMENSIONING

PARAMETER TABLES

INTRA-CLASS CHARACTERISTICS
WIDTH-ORIENTED GEOMETRY

CONDITIONAL LOGIC

INTER-CLASS CHARACTERISTICS
DEPTH-ORIENTED GEOMETRY

PLUS HOUSEKEEPING

SHEET 10

Computer Graphic Communications Association of Printing Industries of America, Inc.

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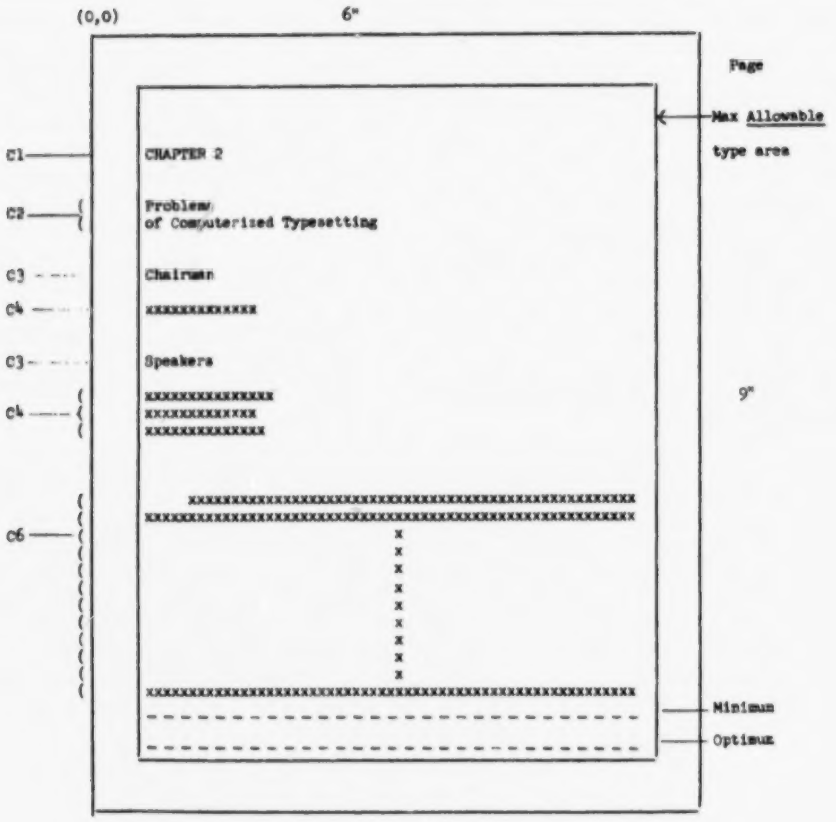
DYNAMIC DIMENSIONING



CONDITIONAL LOGIC 1

LEVELS OF:

SPECIFICATION

APPLICATION

CONDITIONAL LOGIC 2

FLEXIBILITY

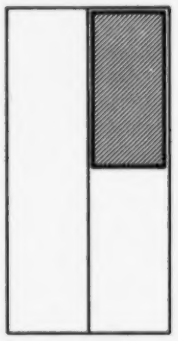
WITHIN A
REGIMENTED PAGE GEOMETRY

PERMISSIVENESS

TYPOGRAPHICAL EXPRESSION
WITHIN A
LOGICAL STRUCTURE

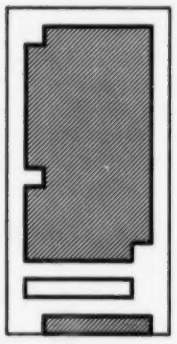
CONDITIONAL LOGIC
... ILLUSTRATIVE EXAMPLE

AS IT FALLS

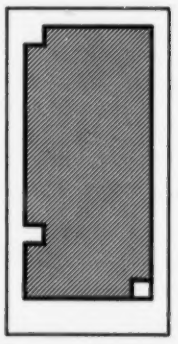


AS IT IS SET

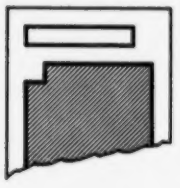
CONDITIONAL LOGIC
... ILLUSTRATIVE EXAMPLE



FALLS



SETS



such happened, I should. Or I would like. Or you may. So, in this example, the ad is spilled to the top of the next column and of course this means that the entries that came immediately after the "call" must be sloshed around to go before it. You must put it at the head and then fill in with the subsequent entries. In most utilitarian documents this won't matter. In some documents a publisher may not like this because there is ad income that relates to the intellectual callout from the directory listing to a particular ad. And that poses a different kind of condition. ((Conditional Logic--Illustrative Example 2)) The next chart illustrates, with regard to straight-text and the capability existent in some of these programs of elasticity in the vertical dimensioning, a case where the running text has come along; there is a heading illustrated in red; and there would be one line of text after this. And the publisher has said, "Completely verboten." The conditional-logic circumstance would be keeping track, so to speak, as you went down. It would know that you only had one line of text after that class of heading and the page had ended. The correction could take the form of throwing that heading to the next logical page and of expanding the leading in the running text as one obvious thing that people might do, but it might not be preferable from the point of view of the publisher. If you wanted to keep uniform spacing, uniform leading, within the body, you would look for areas of white space that it was allowable to change, such as the white space around a heading, preceding and following a heading, if that page had headings in it prior to this time. These are intended to illustrate kinds of logical solutions that you might put into this approach----coarse, to be sure, but intended to be illustrative.

((Full Page)) Witness another drug directory page, somewhat more involved than the one that you have seen. ((Running Heads, Running Feet, Filler)) This has the usual running heads, running feet, and filler; ((Text)) running directory listing copy; and ((Ads)) advertisements which will be called out. ((Full Page)) This is the page that you are seeking from these fundamental constituents and ((12-slide Paste-up Series)) the "build" of that page----with 12 pieces which all fall very nicely into place with the razor, but which may challenge you somewhat more in the machine!

((Illustrations)) These next 3 charts illustrate how one might approach the treatment of cuts on pages and in essence create a circumstance in which you can exercise *preferential logic*. ((Illustrations, continued--1)) Maybe you want the illustration in the upper right-hand corner of the page, if there is a single illustration as in a textbook. If there are two illustrations, you might want upper right and lower right. ((Illustrations, continued--2)) There may be standards of a particular publisher as to where the illustration will fall. These pose more complex logical requirements for the construction of this page by machine. And I think one should point out that it is not to be expected that there will not be required some *man/machine interrelationship*. The optimum, of course, would be that third CRT. If you consider the first one to be the soft input, the second one to be the CRT output to the photographic medium, the third one is the live, real-time man/machine interrelationship where you do page design on the computer----a la General Motors body design. And it is important to realize that the intermediate

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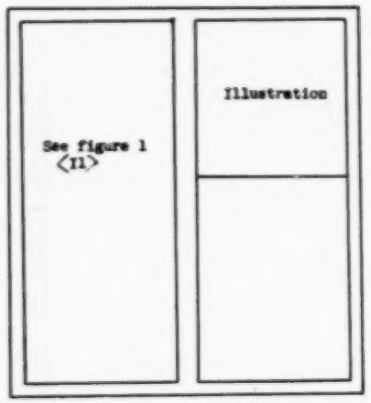
ILLUSTRATION ⟨In⟩

Preferential Logic: Illustration specifications take preference over text specifications

Examples:

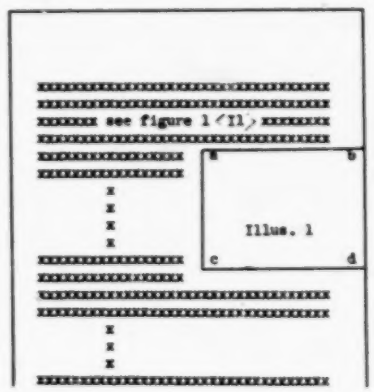
ONE: When ⟨I1⟩ appears, put illustration in upper right corner of page (Pre-established position, recomposition may be required)



TWO: Finish line in which ⟨I1⟩ appears, add one more line, then change measure of text for Y_1 duration

X_1 = X for I1

Y_1 = Y for I1



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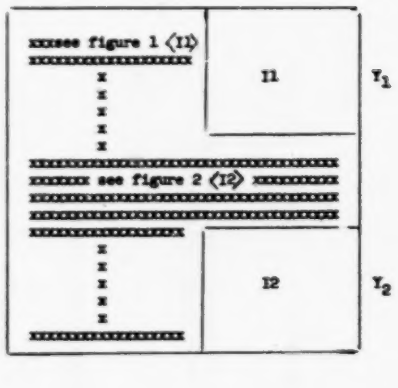
ILLUSTRATIONS (Continued)

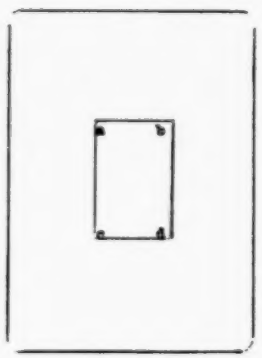
Preferential Logic Examples:

THREE: When a second ⟨In⟩ appears on one page, put second illustration in lower right corner



NOTES:

1. Table characteristics of each illustration
2. Wrap around:
   Relate origin
   (a, b, c, d) to
   page layout

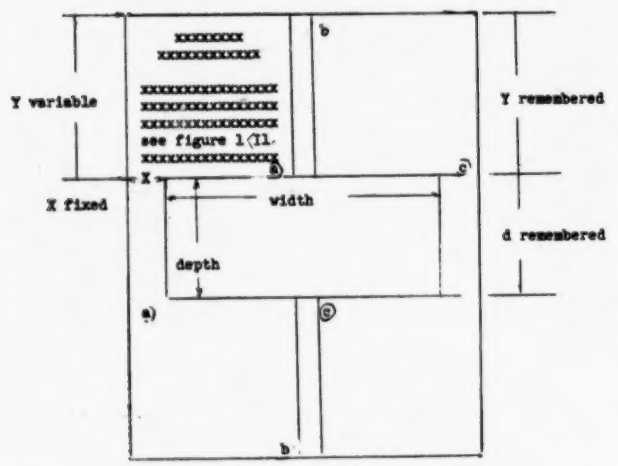


3. Class 1 - words
   Class 2 - occasional illustrations
   Class 3 - multiplicity of illustrations

GRAPHIC COMMUNICATIONS Computer ASSOCIATION of PRINTING INDUSTRIES OF AMERICA, INC.

COMPOSITION SYSTEM WORK SESSION NO. 2
W. W. TUNNICLIFFE, CHAIRMAN

ILLUSTRATIONS (Continued)



Specified in Il :

X

Width

Depth

INPUTS & PROOFING

DATA
FLAGS

EMERGING TECHNIQUES

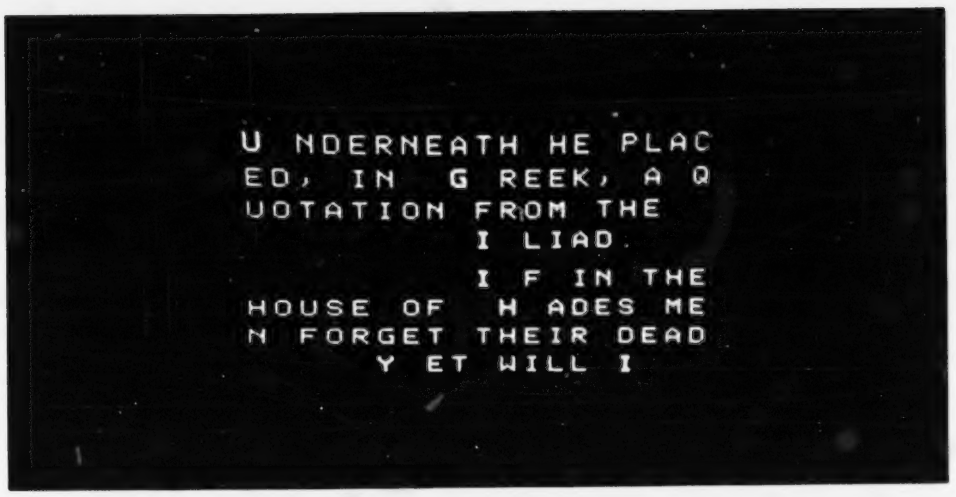
solution----a first page-pass and non-real-time fix----is more economically viable and, therefore, more imperative.

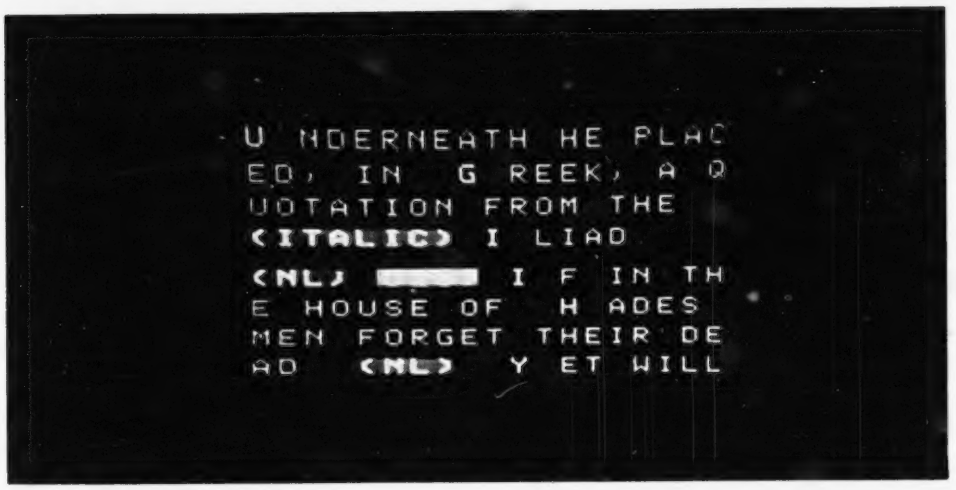
D. Input Techniques

((Inputs & Proofing)) In the input and proofing area we've talked about essentially data and flag identifiers, by whatever names you want to call them. There are some emerging techniques and the keyboard area itself is probably the most exercised of any of these areas within, say, the last 18 months in particular. There have been changes since the ((Input Text)) "Energetic Particle Observation" that appeared in the PENROSE ANNUAL in 1968 where this is the input text, ((Input Corrections)) this illustrates corrections only, as against total reset, ((Page Image)) leading to the finished page.

((7 of Fortune's top 10 companies have one thing in common. They all have better keyboard operators than you.--KTI)) Some of the countless new techniques are in education, but the main thrust of the new techniques is not simply a better keyboarding rate. ((We're out to put keypunches in their place)) Witness growing applications of minicomputer and timesharing input/editing subsystems----capable of geographic separation from the composition computer and the associated photocomposition device. *This is a factor to be considered seriously in the selection of an over-all system concept.*

((Viatron Color-CRT Keyboard Series I: 1 segment, spread apart)) Witness the possibilities of soft input----and the implicit language requirement, and opportunity, which they pose....as illustrated by the use of GENERIC function codes embedded in this synthesized example of a little Greek. ((2 segments; top, closed; bottom, spread apart)) This slide illustrates two 80-character lines where the first one appears for reference and the one currently being entered is spread apart, in terms of line separation, for ease in reading. ((2 segments, both closed)) This slide shows them both closed; ((2 segments, both closed)) this illustrates line advance ----with the first top line being replaced by the first bottom line and the first bottom line moving to the top-line position and the new line going into the bottom-line position, thus affording continuity of reference for original keyboarding or proofreading. ((2 segments, both closed)) Another line advance. ((Viatron Color-CRT Keyboard Series II: 1 segment)) This illustrates an alternate form of display encoding, another illustration of a keying variant offering backlighting as a means of emphasizing function codes ((2 segments, both closed))----perhaps for ease in proofreading separation of content and function code, or, more precisely, in the context of our present concern, MODE identifiers. Note that this approach allows of *joint or separate proofing for intellectual and typographic purpose.* ((2 segments, both closed)) Illustrating line advance ((2 segments, both closed)) and line advance again ((Underneath be placed, in Greek....)) leading, via the inevitable program, to the finished product.





Underneath he placed, in Greek, a quotation from the *Iliad.*

If in the house of Hades men forget their dead
Yet will I even there remember you, dear companion.

The most deeply felt dream of Jefferson's life was over. He, like all men, needed a personal vision to give order and direction to his life. Could he now find one to replace what he had lost? Wandering the Albemarle hills, he simply did not know. It would take almost a decade for him to realize that the words he had written in Phil-

60

E. Software and Standardization

((Great Moments in Data Preparation)) Where are the great moments in data preparation? ((Software)) They are, as you ladies and gentlemen know better than most, in the software! It is, in relative terms, useless to keyboard for computerized composition or, for that matter, for any purpose, if you do not have an input plan related, or relatable, to the software. ((Garbage it's not)) This is a matter far beyond the all-too-familiar GIGO -- or, to introduce a commercial note -- the issue of whose garbage it is when it turns out that way!

((World Map)) If we touch on standards for a moment, this illustrates the metric countries and those which are going metric. The red indicates those which are non-metric. As you can see, at least on an area basis, it seems to be confined largely to the United States and Canada, with some suggestion that they might change their minds. ((Life would be a lot easier if we standardized)) Of course, as in marketing, it depends on how you wrap the product. Standardization can be sold in many different ways. This is the method of the Metric Association. ((Standardized Languages Offer No Benefits to Users)) There are those who have different views about standardization in computer languages and programming languages as you can see from this illustration from ComputerWorld. But it often has to do with environment, ((Cartoon: But will he listen to your troubles?)) and a computer will not, or standards will not, necessarily listen to your troubles.

((Standardization)) Standardization has been much discussed from the point of hole or tape codes, but the things that you will find more to your need are the methodology, the structure, and the meaning. If you want a hanging indent, you want that to mean that and that only with a specified parameter. You do not want ambiguity of meaning. If one looks at printed documents and looks at the intellectual hierarchy of the document, one will often find that, from a typographic point of view, in the same book a given hierarchical level, e.g., a given heading class, may be treated differently in different portions of the book because it happened to be set on different days by different people or the copy had been provided at different times. But this system is based on the logical treatment of everything of a given class in the same identical way, subject to a set of conditions and a set of parameters, which are yours to select.

((The art of progress is to preserve order amid change and to preserve change amid order)) As to system interfaces, one cuts the cable where the wire count is lowest, or most advantageours. Establishing the interface at the INPUT zone would be most advantageour. AND it would establish interfaces appropriate to the establishment of proprietary-rights jurisdictions, which one detects from the handouts to be an issue.

STANDARDIZATION

The factors which are standardized are:

METHODOLOGY

STRUCTURE

MEANING

NOT particular machine code

THE CARE, FEEDING, AND IDENTIFICATION OF

SPONSORS -- CONTRIBUTORS

BIG DADDY THEORY
STANDARDS ORGANIZATIONS
GROUP THINK X GROUP
INDIVIDUAL EXPRESSION

OLD EGYPTIAN SAYING

WHO WILL LISTEN?

WHO WILL TALK??

COST DECISIONS

HARDWARE
SOFTWARE
PEOPLEWARE
OTHERWARE
TURMOILWEAR

J.P. MORGAN'S FRIEND

CAPABILITY

FULL
PARTIAL

IN-HOUSE
OUT-OF-HOUSE

VI. SPONSORS

((The Care, Feeding and Identification of Sponsors/Contributors)) In the care, feeding, and identification of sponsors and contributors there is the Big Daddy Theory which went right out the window, and more particularly so in recent months. There are the standards organizations, the most active of which is represented by Dr. Duncan here today. There is group-think, as expressed by the members of any cooperative endeavour and there is the area of individual expression, which might be spelled family because it all comes down to time.

((There'll Be Less Leisure Than You Think)) There must also be a state of mind; there will, indeed, be less leisure than you think. ((Everyone told the ram)) And there must be conscious intent----Everyone told the ram, "You can't...punch a hole in that dam," but the really small print says, "They forgot that determination often makes an impossible dream come true."

VII. COSTS

((Cost Decisions)) In the matter of cost decisions one can take out his handy-dandy character generation notebook which GCCA has published on CRT's. One can look at sample pages, find out the run times. These are the pages which Mr. Lannon used in his document, and one can look at the results of Mr.Lannon's work. One can talk with manufacturers and get costs. He can create circumstances of estimation which apply to his particular environment. He will include factors for hardware, software, peopleware, the other ware that we have talked about. The one thing that we haven't mentioned at all is that he better be prepared for a little turmoilwear. And this one is spelled slightly differently - and recently has been termed EMOTIONAL cost. And depending on the appetite that he has created for himself, in terms of capability, whether he wants full or partial capability, whether he wants to have the work all in-house under his control or whether he wants to allow of some being done outside his firm, he might do well to bear in mind (if he considers full capability) the response given J.P.Morgan's friend when he inquired about how much does it cost to have a yacht. You all know the answer: If you have to ask the question, you can't afford one.

((Egyptian tablet)) There is that old Egyptian saying, carefully carved on a stone tablet, that there is no such thing as a free lunch. Nobody is going to do this job for free, quickly, immediately, and hand it to anybody in this room on a silver platter, although I would love to be challenged, love to be told that I'm wrong. The basic question is not only who will listen, although that's easier to determine, but also who will talk. There are those who are practitioners and I sometimes think that, with certain notable exceptions, those who are the most successful talk the least. And it remains for those of us who are conjecturalists in the field of computerized composition, who have no operating establishment, no vested interest, no proprietary right, to talk. But somewhere in this group there must be action of that kind if this is to proceed.

((Make no Little Plans)) As regards financial magnitude one should make no little plans, ((If you need a fast, objective analysis)) nor plan on any quick triumphs, for, if you need a fast, objective analysis, and, ((THINK AGAIN!)) if the past has been a guide, one must, indeed, think again. ((Attention to even the smallest detail makes the DIFFERENCE)) As it is in the racing business, attention to detail is the only solution to that particular problem, and the detail is enormous.

VIII. ROLES AND GOALS

((CREE SQUAWS ARE AMONG THE WORLD'S BEST FEATHERPLUCKERS)) But each of us may find his place in this wild world of bits and bytes. Some of us are chicken pluckers; some of us are information processors; some of us are computer programmers; some of us are printers. But there is a role for everyone in putting this system together. ((WHEREVER A MAN GOES, THERE IS A GREEN MOUNTAIN"--A Japanese Proverb)) One must retain the spirit of optimism which runs through this old Japanese proverb, and, as you will have noticed, the mountains can be white as well as green.

((AT&T: Reach out for someone. To communicate is the Beginning of Understanding)) If we can shift to a montage paraphrase, in which Mother Bell encourages us not only to use her facilities but I think also, in our own orbital paths, to try and communicate to develop a system which will meet the needs of the publishers and the publisher's manufacturers together. ((The Not-so-Brief Case)) It will take concerted, cooperative effort to develop this not-so-brief case. ((ONE MAN'S VISION, MANY MEN'S SKILLS)) To follow Premier Smallwood's example, and persistence, in making Churchill Falls a reality -- now most urgently needed.

((Benard Cell Cloud Formation)) In our own chosen Labrador, the air may be rarified, the scenery beautiful, ((STOP: THE AREA AHEAD HAS THE WORST WEATHER IN AMERICA. MANY HAVE DIED THERE FROM EXPOSURE, EVEN IN THE SUMMER. TURN BACK NOW IF THE WEATHER IS BAD.)) the terrain dangerous, but shall we be dissuaded? or prepared?

((GOAL)) The goal is simply stated: DEFINE AND DEVELOP AN INPUT LANGUAGE OF IDENTIFICATION AND SPECIFICATION.

IX. ACKNOWLEDGMENTS

((Report from Ottawa)) It is a pleasure to acknowledge the contributions of those who have participated in the conceptual extensions of the original contribution to the Canadian Centennial, presented at a Character Generation Committee meeting in Ottawa/Hull in September 1967. The concepts were discussed and expanded in work sessions in Washington/Bethesda in July, August and September 1968. They have subsequently been described at Las Vegas in November 1968 and in New Orleans in November 1969. These meetings have all been held under the auspices of the Graphic Communications Computer Association (then the Computer Section), a section of the Printing Industries of America which has consistently provided significant support to these considerations.

((That Old Gang of Mine)) ((Contributing Organizations)) Contributing organizations are listed in the slide, and direct recognition should be given to those participants in attendance at this meeting: Norman Scharpf, Roger Schubert, John Seybold, Bernard Taymans, and Tommy Tompkins. The contributions of all are sincerely appreciated, and the responsibilities are, of course, those of the author----with the conventional disclaimer that the material presented does not represent the views or position of any of the Government agencies, associations, or commercial organizations listed.

X. EPILOGUE

((Where do you go from here? The sky's the limit.)) As to course, where would you like to go from here? It is suggested that it will take ((idea power)) the application of idea power, and, ((Motivated Men Made America Great)) one should remember, a certain degree of motivation.

((Figure at Microphone....Harangue)) By a combination of what, hopefully, has been a compatible mixture of aural and visual imagery, I have tried to portray what a USER might desire from whatever system might be created for the publisher's manufacturer ....not so much by discussion of technical detail, but rather more by the *imagery of conceptual outline* of a possible system....not in deathless prose but in a montage of audio-visual one-liners, with an occasional chart of detail. IF it has provoked your thought, if it has stimulated thoughts concerning imaginative application of software, imaginative development of economically viable and organizationally tractable business systems....then *THIS communication form will have served its intended purpose.*

CANADA	UNITED STATES
GOVERNMENTAL	
Government Printing Bureau	Government Printing Office Defense Supply Agency National Bureau of Standards National Institutes of Health
PRIVATE SECTOR	
Southam Printing Co.	The William Byrd Press, Inc. Courier-Citizen Co. Corley Printing Co. Herbick & Held Printing Co. Phillips & Van Orden Div. Radnor Graphic Arts, Inc. Rocappi, Inc.
COMPUTER MANUFACTURERS	
	International Business Machines Corp. Radio Corporation of America

Book Publishing Needs for Computer Photocomposition

Leonard Shatzkin

There is no doubt that in time the computer will be the principal method of book composition. Why is it taking so long? Why, except for highly specialized applications, has so little book work been processed through the computer?

Obviously because computer composition has failed to meet the needs of the book publisher. Are these needs so complicated? No, paradoxically, they are very simple. They have simply not been properly identified.

Certainly the book publisher's requirements are much more modest than those of the newspaper or magazine publisher who will want to enter manuscript into the computer in the midst of the creative process. This requires on-line keyboarding, instant retrieval of any item for updating or examination, running inventories of the editorial storage bank, facilities for elaborate page make-up including all graphic matter, and so on.

The book publisher deals with a completed manuscript and has the pathetically simple problem of converting that manuscript to typographic form within easily defined conditions, without introducing errors.

Instead of analysing the function of text composition in book publishing and determining the real needs to be satisfied, the computer compositors have gone to the buyers of composition to be told what was needed. As a result, they have devoted great effort and much money to making their automobile look as much like a horse as possible.

The practices that grew up out of the needs of hot metal (and particularly linotype-composition) to which the buyers of composition have become comfortably accustomed, became the norm against which computer composition was measuring its readiness to serve.

The computer compositor accepted the whole schedule of events, of galley proof, and page proof, and front matter copy and index copy waiting on pages, and the normal incidence of author's alterations, plus the need to solve typographic problems in the same manner and variety as they are solved by a stonehand. He did more than that; boasting of the computer's versatility, he added a few typographic tricks beyond the linotyper's ability.

All this managed to prove a point: if the computer is to enter the composition system with no changes in publishing practice, it will have to be subsidized because composition costs will go up - with no remarkable advantages.

Just consider the most outstanding piece of nonsense - hyphenation and justification. Imagine yourself operating a linotype machine without a quadding attachment. How can you escape hyphenating? If hyphenation did not exist, you would

have to invent it. Even more so with justification. Compositors even charge extra for the use of thin spacebands, because narrowing the justification range slows the operator so markedly.

Yet, useful as they are to the linotype operator, who can pretend that either justification or hyphenation do the reader any good. As a nuisance, justification, with its variations in word spacing is tolerable, but hyphenation is unmitigated.

And by the way, I wonder if the archaic requirement that every page end with two full text lines (to avoid being called a widow) does not go back somehow, not to the publisher's needs, but to the letterpress pressman's needs to avoid making that page ready individually.

I don't know how to estimate the amount of money that was wasted in developing hyphenation and justification routines - I am speaking of books now, not newspapers or other users - to fill a need that is about as genuine as the requirement that automobiles whinney or drop soft balls of manure behind them as they go.

The computer compositor will answer that a "need" is what his customer demands before he will buy the product - whether his customer is right or not. True. But one might have expected a little more leadership and creative selling from the people who understand the new processes best. And their failure to meet the challenge of the naive customer has contributed to high computer composition cost.

The failure is not only in accepting the unnatural burden of hyphenation and justification. It is of a piece with the galley, page-proof, author's alteration syndrome and the "we'll-give-you-any-type-face-or-typographic-format-your-wild-imagination-can-conceive"siren song to designers.

If the effort and money invested in meeting all these false needs had been devoted to the things that matter, we would be much farther along with computer composition for books today. I freely admit that this would also have required more interest and greater participation on the part of the publisher. But that would have been more likely if computer compositors had shown some leadership and attempted to develop a dialogue with publishing management rather than with production men or designers.

The first step in this direction would have been proposing to publishing management a set of practical goals in method of operation and in costs which merited some mutual effort to achieve. This would have required some initial curbs on design freedoms, probably only short term. Because it would reduce the programming cost on each book going through the system (apparently now admitted to be a real factor in the computer's failure to compete while it computes) and would simplify coding, the publisher would have

been willing to accept a narrowing of typographic formats. This would reduce the cost of detecting or correcting coding errors and perhaps permit the publisher's copy-editor to insert the codes into the manuscript.

Why should the publisher insert the codes? Because he makes all the decisions for which the codes are merely signals and it is simplest and safest for him to enter them directly.

Even more important, the successful practice of coding by the publisher would naturally lead to his undertaking the keyboarding as well, with obvious advantages to both publisher and compositor.

Perhaps this is a good point at which to come back to the topic of our discussion. What are the book publisher's needs in the matter of computer photocomposition? I must confess I don't like the question. His needs, of course, are to get the book set into type so he can print it. He may tell you he needs lower costs, but that is a meaningless conditioned response which the publisher, awake or asleep, makes to any question relating to manufacturing.

Perhaps a better question would be: What can the computer do better or differently to improve the publisher's situation, primarily his economic situation, sufficiently to warrant the effort and investment?

Now we can supply some interesting answers! Present composition methods require checking of results and intervention by the publisher at several points in the composition cycle. This is unavoidable because:

1) The publisher's instructions may have been unclear or misunderstood for whatever reason.
2) Some decisions (folios on contents pages, index entries) depend upon prior, not completely predictable steps.
3) The compositor may make an error, such as hitting the wrong key, stripping incorrectly, etc.
4) The machine may make an error, such as a transposition, wrong font, etc.

That is why the publisher must see proof of the work at various stages. Of course, folklore, as it has done with hyphenation and justification, has hallowed necessity into virtue, as though there might be some higher purpose for sticking your thumb into the cake than to see how it was coming along.

The computer should eliminate all this. If the manuscript is accurately keyboarded and the program tested, the result is determined and predictable, and there is no earthly reason to stop the process to see whether all is going well, any more than you would expect to check the computer's mathematical calculations with a pad and a Venus pencil.

The key is verification of the accuracy of the keyboarding before the tape is allowed to enter the system. This is no more mysterious than the need to assure correct input into any computer system and there are all sorts of well-tried ways and some not yet tried for doing this.

Once he understands how this new process works, the publisher will want to do his own keyboarding and the verification of his own keyboarding, because once he is satisfied he has the tape right, he can send it to his compositor and get page negatives almost by return messenger.

What does this do for the publisher?

1) Because the manuscript goes thorough the process once rather than several times, the cost of composition is reduced.
2) The elimination of proof, in itself, reduces cost substantially. For a publisher like McGraw-Hill the annual saving, if proof were eliminated, would be of the order of one million dollars, including a significant reduction in staff.
3) By sharply reducing the time required for composition and sharply increasing its predictability for scheduling subsequent operations, manufacturing time from manuscript to finished book could be reduced from 6 or 7 months to 6 or 7 weeks. This would speed turnover of the publisher's up-front investment and would make more publishing projects, those for which timeliness may be an advantage, eligible for consideration.
4) The productivity of authors and editors would be substantially improved.

In the face of this, suppose that the simplification of programming required that all running heads would be italic one size smaller than the text type, or that Times Roman could not be used for folios or some other shattering restriction on the designer's freedom to please his mother-in-law's eye for typographic style? Would anyone seriously care?

But instead of trying to solve the book publisher's problems, the computer compositor has been concentrating on the book designer's problems. He has been selling the wrong product to the wrong people at too high a price.

What is needed to operate a system based upon the publisher supplying a corrected tape (either keyboarded by him or under his supervision) which will result directly (so far as he is concerned) in final page negatives?

First, the software to make all the typographic decisions including page make-up and to deliver a tape to drive the CRT. This, at least in the beginning, will require a great deal of compromise in book design to keep the programming manageable. Some sorting will be necessary to choose manuscripts which are suitable to the current state of the program. At least temporarily, the computer will have to be

given broad leeway to adjust pages to suit the length of the book. Rules on widows and other niceties will have to be relaxed.

Secondly, the coding system must be simple. This will make more people eligible to use it (the publisher's copy-editor, for example) and will make coding errors less likely. The simplicity of the initial typographic rules will help make coding less complicated.

Thirdly, keyboarding, verification and correction must be made as easy as possible for the publisher. It is not essential, at the start, that the publisher do his own keyboarding, but it is so logical that he do it, and so convenient, as the volume becomes significant, that it should be encouraged from the beginning.

Those requirements, plus the essential one of publisher cooperation, are necessary to make the quantum jump in composition efficiency.

That is not the end, of course, but only the essential beginning. When this system is operating, refinements will follow.

The publisher will want to update already published books by addressing the published version of the book by page and line number. That should be relatively simple.

He will want to build data banks by a master indexing system which automatically selects the portions of each book which should be stored and discards other portions.

He will want to simplify copy editing by passing the manuscript through a program which does some checking and which identifies problems for solution by the author or copy-editor. This will probably involve keyboarding unedited manuscript (or passing it through an OCR) which may move keyboarding back beyond the publisher to the author.

As he gets used to the idea of fast book production and enjoys its advantages, he will be looking for ways to go from CRT to plate directly instead of through page negatives which must be assembled and exposed.

All these later refinements make sense only after the computer wins its place in book publishing by making the quantum improvement in composition. There is no doubt that it will happen. The question is really whether this improvement will take place by blindly and expensively meandering from minor contribution to minor contribution over a long period of time, or rationally solving the key problems directly and with a minimum of wasted effort.

Hardware Capabilities and Requirements

P. L. Andersson

When I was invited to prepare a paper on the requirements and capabilities of computer photocomposition hardware, I looked back over the past eight years in which computer techniques have been a factor in the graphic arts and wondered if it was possible to say anything new. So much has been written in this field that perhaps there are few worthwhile new things to say, but then I decided that there are at least many old statements well worth repeating. So with this in mind, and with the thought that I do not personally feel that the greatest need for new hardware necessitates any major breakthrough in speed, accuracy, or quality (while admitting that all of these factors can and will be improved) but do feel that total cost performance factors for all machines could stand to be improved, I have tried to collect the ideas which to me are most cogent for a statement of the capabilities and requirements of computer typesetting hardware.

A good place to begin is with the cost performance ratio of phototypesetting systems, since this is the only indicator of how well the capabilities of a system actually meet the performance requirements. The cost performance ratio of a phototypesetter is the cost of the machine divided by some performance factor, or combination of performance factors, which the user feels are important in his application. The cost cannot be taken as the price, since altogether too many other factors are involved in the ratio. Some manufacturers' habits of simply dividing the price of a machine by the speed in lines per minute to get the cost per line per minute are valid enough if speed and purchase price are the only criteria which are important, but these fall far short when one considers what must actually go into a meaningful evaluation. For instance, the time which the operator must spend coding the input tape for the computer program which drives the system, the time the computer spends perforating the tape for the system (note that this can vary considerably depending on whether or not the phototypesetter used requires one, two, three or more frames of tape for each character), the actual cost of the computer itself including maintenance, the time which the phototypesetter spends setting the particular group of lines, including set-up, and time which must be spent in pasting up the finished product until it is ready for platemaking, including the cost of corrections, etc. should be included in the overall cost. There are no hard and fast rules for what these values should be; rather they can vary over a considerable range depending on the cost of money, expressed as interest, cost of floor space, etc. as well as the type of work being done and relative wage scales which prevail in various plants. Since these values are quite dependent on specific situations, my usual practice is to evaluate these factors locally in terms of the relative cost/performance ratio of several hardware configurations which are all capable of accomplishing the given objective, then comparing the relative values obtained. If you work

through these factors, you occasionally derive some surprising results, including the fact that for some types of work, a superscale computer driving a CRT typesetter turns out to be cheaper on a job basis than one girl using a $5,000 mini-typesetter. When all the factors are taken into account also, it becomes easy to see that it is possible to make minor changes in today's typesetting machines which will greatly improve the cost effectiveness of the entire system.

Let me give you an example or two of almost trivial changes in phototypesetting machinery which would make the equipment far more useful, without materially adding to the cost of many machines. For instance, there are several different ways of setting type by columns. One of the simplest is to set type in galleys, then cut the galleys up into pages. This is the way it has been done in hot metal for many years. Suppose, instead, the phototypesetter was equipped with a reverse leading device to permit the phototypesetting paper to be backed up so that the second column could be set next to the first. Now this is a good solution, and there are machines available today which have reverse leading as an option. Unfortunately, this solves only one-half of the problem. You can reverse lead and set the second column but, when in a position to do so, the machine must start once again all the way over at the left hand edge of the original column, then reset all the white space between the left hand edge and the start of the new column. Doing this is slow, but the alternatives are few. The use of a sufficiently large computer, granted, will permit the lines to be formatted in the correct order for a once-across-the-page sweep, but without a large computer system, the only alternative is still hand paste up. All that is needed here is some way to return to an intermediate point to start the next column, a capability which could be incorporated into many, if not most, machines today at nominal cost. With machines which can be driven directly by unjustified tape, the additional circuitry to count lines, when combined with this reverse leading and "tab stop" mechanism,would add quite powerful format control facilities.

As another example, in the publications or magazine typesetting field, Roman, Bold and Italic are generally used for text in sizes from 9 to 11 points. The only other size used on many pages and, in fact, through some entire publications is a fourteen point sans-serif subhead. The manufacturer who offers the capability to set this combination will have made a major step in meeting the requirements of a large market. This combination, both in style and in size, is certainly within the easy range of many small phototypesetters today, yet no manufacturer has constructed such a machine, probably only because this was not one of the combinations available on linecasters.

So much for the examples. What I am trying to say is that today there seems to be too much of a desire among manufacturers of phototypesetters to build units which only mirror the capabilities of hot metal technology, without

concern for the systems aspects of the user's requirements. It also seems to be true that among large machine manufacturers there is a corresponding drive to construct extremely fast, all powerful systems which are capable of doing everything in the typesetting field except making money for their users.

Please remember that I am not attempting to condemn the user or the maker of either large or small systems. I am simply stating the basic principle that it is not enough to take the specifications of old machines, however well they served the user, and bring forth a new machine, developed around a basic new technology, with the same or similar specifications. The machine must be designed to perform at maximum efficiency when utilized in the application for which it is intended. When the machine or system will do that, it is a device whose capabilities meet the requirements of the user and will probably be considered the best possible system design.

The question of the large vs. the small system is due for a little more consideration than has been given the matter in the past. This is a controversy which is now raging through the computer industry. The nation's largest computer manufacturers have recently announced mini-computer systems, while at the same time the traditional mini-computer system builders are engaged in a violently competitive price war, to some extent due to the large number of manufacturers now trying to establish a foothold in the market. At least the computer industry seems to have finally realized that both the large system and the small have very definite markets and, within the framework of their limitations, there is plenty of room for both.

The prefix "mini" as it is applied to computers is somewhat of a misnomer, since it gives the impression that the machines themselves are not very powerful or very fast, while in fact, pound for pound, they may compare very favorably with larger brothers. Some mini-computers boast indexing capabilities more powerful than those of the IBM 360 series. Many machines have considerably faster cycle and add times than their larger counterparts, and many of the machines have extended arithmetic capabilities found only on very large systems. The lack of data processing peripherals and of memories are the only things which make them mini-computers. Both classes of machines are effectively used to perform all typesetting functions.

Stop and compare this field with that of typesetting for a moment. Many of the small typesetting machines have the capabilities to accept unjustified tape and provide justified and hyphenated output tape, a feature usually not found on the larger machines, so there is a certain parallel. A point by point comparison could go on and on, but the prime reason for selecting a large machine over a small one should be, but almost never is, the need for the capacity or capability represented by the larger machine. In today's

market, I believe that many of the purchasers of large typesetting systems have simply counted the linecasters in their composing rooms and, if there are ten or so, calculated the replacement cost of these with new linecasters at about $30,000 each at current prices, then decided that they would rather spend $300,000 or so for a large CRT machine. Perhaps before they sign the order they have even experimented with some electromechanical machines but they lacked the technology to keep these running properly, so they have gone on to bigger things without ever considering the even greater background of computer expertise, personnel and simple sales ability needed to keep CRT machines running.

The user who has a genuine requirement for a large machine and who keep cutting his job into bits and scraps so that he can run it on a myriad of mini-typesetters is equally foolish, but just as prevalent. The point that I am trying to make is that equipment requirements are frequently not very well matched to the capabilities of available machines by today's graphic arts personnel.

With this in mind, let us try to look at the broad spectrum of equipment capabilities and requirements for computer phototypesetting equipment in a general way. If one had asked a printer in the years after the Civil War about his requirements for composition systems, he probably would have said that he only wanted to be able to set type faster. If you had asked about the capability to set different sizes, he might have asked, "What for?" I'm certain that he would have been perfectly happy to pick the larger sizes from cases. So when the first typesetting machines were developed, and I mean both the Linotype and the Monotype, they were designed to set only text sizes. Once these were being used, however, a requirement for setting larger sizes by machine came into being. After machines had been designed to set larger sizes, then requirements were again modified to include mixing of type styles, automatic quadding, tape control, etc. Some of these requirements have been met only recently by new photocomposing machines. With the beginning of phototypesetting, the true mixing of many sizes became possible, leading to a requirement for many different type styles; so with every new advance in technology, a seemingly self-regenerating requirement for even greater advance is created, leaving the gap between the capabilities of available machines and the requirements of current users not a thin line, but a broad shifting belt. Qualified users always seem to be devising new requirements which are at best poorly met by the manufacturers of typesetting machinery. In many other high technology industries, this is far from the case. In the instrumentation field, for instance, the manufacturer generally introduces equipment containing features not even considered by the user. Perhaps this has not happened in the graphic arts because traditionally it has been necessary for the users to have to beg the manufacturer to add a feature desperately needed by each and every one. Even then, all new options for the linecasting

machine were devised by third parties and added to the standard machine only when the manufacturer was driven by dire necessity.

With this background, it is not hard to see why most graphic arts manufacturers are not very knowledgeable about, and even less responsive to, the needs of the users. It is my contention that they should be and, if they are not, the field has now become sufficiently competitive so that they can no longer survive. We are a long way from the marketplace of fifteen years ago when there were three manufacturers of typesetting machinery but only two machines, to the marketplace of today, where there are twelve manufacturers and over thirty machines.

Better systems design of all typesetting machines will be the most important improvement in the future of computer phototypesetting machinery, but other changes can be seen also. The use and general availability of better typesetting programs is bound to increase, particularly with regard to editing, correcting and merging capabilities, but this is a problem which can and will be solved by better communication between users. The simple machine qualities such as speed, line length, code acceptance, etc., is at a point where future prediction is easy indeed. Certainly there will be faster machines, but there will probably also be cheaper machines because, in any given category of users, there are always people who will accept any reasonable combination of capabilities, provided the price differential is sufficient to live with the features which have been eliminated. This means that new machines will always be introduced at the bottom of the price and capability range, while existing machines are being upgraded as a result of operating experience. A look at the specifications of typesetting machines over the past several years will show that this is exactly what has happened.

In short, I want to go on record as saying that I believe that there will always be a need and requirement for both small and large machines and that I do not believe that there will ever be a situation where all typesetting is done by corporate giants, using super systems, any more than all computing is done by computer utility systems using super scale computers.

I do believe, however, that there are some applications for systems which combine the advantages of both large and small. For instance, what about the future for small in-house typesetting machines, connected directly to telephone lines, and driven by a large scale, time-shared system? In this case, the user would benefit from tremendous on-line computing capability and memory capacity of the central system in the form of the ability to automatically index, abstract, move copy blocks, correct, edit, etc., while not having the capital investment required to maintain a computer of the size normally needed to perform these operations. Several $10,000 typesetting machines and typesetting terminals

are available, which would be entirely adequate, for applications such as some periodicals, directories, prospectuses, technical manuals, price lists, small parts lists, and some plain text technical books. There is even the possibility of using a facsimile machine as the output unit for the system, with the computer automatically generating the electrical input. This method of typesetting has been considered often in the past, but will probably not become practical until better facsimile equipment becomes available. I am not going to enter the controversy of whether it is better to use typewriters or CRT editing terminals to input data to the system, once again because there are applications for both.

In the graphic arts today, there is a good possibility that almost any sound system suggested in the past for electronic typesetting will at least be tried in the future and there is an even better possibility that many completely new schemes will be devised. People talk of using lasers so frequently that a somewhat similar device, the light emitting diode, is usually forgotten. Work now being done in the construction of large arrays of light emitting diodes will eventually lead to some very fast, high power, units which could be used instead of a CRT tube as the basis for an inexpensive method of building a super fast typesetter. Corresponding work in computer memories as well will reduce the cost of many high speed systems and techniques, and things like plated wire, flux ring and integrated circuit memories may well do much to improve the cost performance ratio of future typesetting systems.

It is no longer possible to say that we are "on the threshold" of computer phototypesetting. We are well over that legendary threshold and firmly entrenched in the era of computer phototypesetting. Of the three original manufacturers of hot metal typesetters, one ceased operations some months ago, one announced the halt of linecasting machine production on November 16th, and I have no doubt that the sole remaining manufacturer will soon follow suit. Hot metal methods, if proven technological forecasting methods are any indication, will no longer be a significant part of the printing industry by 1980. I therefore believe that the time for a closer matching of requirements and capabilities, not based on traditional factors, is here now and, in fact, is long overdue. The cost performance ratio of all equipment can and should be increased through constant attention to the needs of the user and a constant willingness on the part of the manufacturer to reflect the results of that attention in the design of new machines.

Third Generation Photocomposing Machine

Edwin R. Kolb

A photocomposition machine is one which produces typography on photosensitive material. The typography might vary from as simple an element as a character, to a line, to a galley, to a full page, or to a full page complete with graphics. The photosensitive material might be photographic paper or film or a photographic printing plate material. Generally a machine is classed as a phototypesetter, if its main output is lines of text, and as a photocomposition machine if it can output not only the text but show the text as it is arranged on a page, complete with heads, folios and other typographic variations typically found on pages.

Phototypesetting machines can be classified and referred to as first generation, second generation or third generation. An example of a first generation phototypesetter would be the Intertype Fotosetter, introduced in 1949. This machine was mechanically similar to a hot metal linecaster, except that instead of casting a line of type, it exposed a line of photographic images at a rate of about five characters per second. The second generation phototypesetters make use of electronics. Typical machines in this category are the Fototronic 1200 and TXT, the Photon 200, the 500 series, the Compugraphic series, and the Mergenthaler Linofilm series, among others. These machines store analog images of the characters to be typeset. They select the images in the correct sequence and position them in the correct locations on the output photographic material at rates ranging from 5 to 75 characters per second. Third generation photocomposition machines have in common the fact that at some point the character form exists as a sequence of electronic signals and the characters are generated piecemeal on the face of a cathode ray tube. This luminescent image is then projected and a photographic material exposed at peak character rates up to 6,000 per second. Character positioning is accomplished either electrically or mechanically or by a combination of both methods. Typical of the machines in this category are the Fototronic-CRT, the VideoComp, the Linotron 505 and the Linotron 1010. It is this last category of machines which will be discussed here.

Commercial machines in the third generation category generate the images of the typographic characters on the face of the cathode ray tube, using either dots or strokes for elements of the individual characters. The original characters are stored in the machine either in the

form of an analog image of the character, or in a digital form. The Linotron machines use the former method while the Fototronic-CRT and VideoComp use the latter method. In the former method, the character images are stored on glass plates, and each image is selected and scanned using a small character size raster. The Fototronic-CRT and VideoComp, on the other hand, store digital representations of the characters. These are read either from disk memory or from core and the selected sequence of characters regenerated on the output cathode ray tube at the correct size and in the correct location within the line. In the Fototronic-CRT the characters are painted by a series of dots such that the beam motion always stays within the bounds of the character itself, while in the VideoComp the characters are generated from line segments. Because the characters are processed electronically and displayed on the cathode ray tube, their size can be changed by changing the horizontal and vertical gain simultaneously and in proportion. However, if these two gains are changed with a different ratio, either an expanded or a condensed face can be obtained. Also, if part of the vertical scan of the character is added to the horizontal scan, it is possible to obtain an oblique character which simulates an italic face.

In these systems the speed of writing characters is a function of the amount of time required to scan the character; consequently, it is a function of the size of the character. Typical throughput speeds tend to run from 300 to 1,500 characters per second. Because the characters are built up of elements, their resolution is limited. Resolution is referred to in terms of TV lines per inch. Acceptable quality graphic arts characters can be produced at from 500 to 1,000 lines per inch. In some cases resolution can be lowered as far as 400 lines per inch or raised to 1300 or 1800 lines per inch.

Input to these systems can take one of four main forms. First, a keyboard can be attached directly to the input of the system. In general, this is not done because the rate of keyboarding for one keyboard is a very small percentage of the throughput possible with this equipment. Typical of the slower machines is the use of a paper tape input. Where higher speed is required, a magnetic tape is used. Some of the machines have been connected directly on line to the computer system.

In general, these machines need a computer to process the raw data, to format it and prepare a properly coded tape

to drive the photocomposition machine. The computer is used to break the text into lines with or without hyphenation as desired, to break the lines into columns and to break the columns into pages. It processes running heads, folios or page numbers, footnotes, extracts and poetry and places these properly on the page. It can handle tabular matter and assemble the information in the tabular fields as desired, generating rules, both vertical and horizontal. It can merge graphics with the text, so that a complete page containing text and line drawings can be output by the photocomposer. The computer accepts the information and the typographic instructions for the assembly of the pages. It processes this information, retrieves information on graphics and fonts from storage, and outputs a correct tape capable of driving the photocomposer to produce the desired page.

The output itself is achieved by photographing the luminous display on the face of the cathode ray tube. In some systems this is done at a magnification of two times the size of the cathode ray tube. In the Fototronic-CRT, the optic system is one to one, while in the Linotron 505, it is seven and one-half to one, or a reduction from the face of the cathode ray tube to the output film. In all cases, the usual output from these systems is full size typography. However, it is possible in some of these systems to obtain microfilm directly. In addition, it is possible to expose paper offset plates directly with the light from the cathode ray tube.

Third generation photocomposition devices vary in how they assemble characters into lines and lines into pages. On the Linotron 505 the characters are assembled into a line by the mechanical motion of an optical system. Successive lines are assembled into pages by moving the photographic material. In the case of the Linotron 1010, the characters are assembled into lines and the lines are assembled into pages by using the area of the face of the cathode ray tube to represent the entire page. Page size is limited to 8 by 10 1/2 inches. In the graphics mode the VideoComp can operate the same way if the page size is limited to 7 by 9 inches. The normal mode for operating the VideoComp and the Fototronic-CRT is to set a line at a time and to move the photographic material between lines. In the case of the Fototronic-CRT, it is possible to continue setting type while the photographic material is moving. This feature, called dynamic leading, allows for any size page to be set without spending time solely moving the film or paper. Further, the reverse leading feature of this machine, as with a full face machine, allows information to be displayed in any sequence.

In addition to using the character generator to expose images on the photosensitive material, it is possible to produce images using the rule generator or vector generator. In the case of the Linotron 1010, VideoComp and Fototronic-CRT, this facility allows for the generation of line drawings and the mergings of these line drawings with text on the output media. Besides the ability to do line drawings, several of

the manufacturers are experimenting with halftones. However, this facility is not currently commercially available.

Quality of the output of the digital character generators is a function of the resolution of the images, the basic image design and the digitizing technique used. While the quality that can be produced by the different third generation photocomposers varies, it is generally equivalent to that produced by hot metal composition and is therefor acceptable to the typesetting industry. This quality is significantly better than typewriter or lineprinter quality, but is not as good as the highest quality photographic output.

Font storage capacity varies with the different machines from one font up to 40 fonts or approximately 4,000 characters or more. Typical storage capacity in [illegible] in the industry falls between 256 and 1024 characters. In general, the machines which store the characters in analog form on film grids have an upper bound on character storage, while those which store in digital form either have been modified or can be modified to store virtually any number of characters. However, characters storage costs and access vary depending on whether the basic storage is in core, fixed head disk or moveable head disk, and the efficiency of the coding used.

Compared to second generation phototypesetters, the third generation photocomposition machines are considerably more flexible. The fact that the characters are generated digitally allows considerable manipulation. Point size can be changed at will, new expanded or condensed typefonts in various degrees and oblique fonts can be instantly generated. In addition to this, the dynamic leading of the Fototronic-CRT allows long galleys to be set without any time spent in moving the film or paper. Furthermore, the Fototronic-CRT and Linotron 1010 can compose an area in any sequence, going back and forth from top to bottom or left to right, in any reasonable manner. This is also true of a VideoComp equipped with the full face option within the 7 x 9 inch page size limit.

The population of commercial and government installations of third generation photocomposers is estimated at 12 Fototronic-CRT, 5 Linotron 1010, 43 Linotron 505 and 45 VideoComp-Digiset. Table 1 shows a comparison of the four machines currently in use in this country. Applications include telephone directories, other directories, books, catalogs, price lists, parts catalogs and newspapers. Depending on the complexity of the page, these machines produce between 15 and 900 pages per hour. For example, simple book pages may run 900 per hour and 4 column telephone directories, 180 per hour.

Both the Fototronic-CRT and VideoComp can generate line drawings on the output page. The Fototronic-CRT uses an offline laser scanner called the Fototronic Graphic Digitizer to scan the graphic and produce a compressed code represen-

tation on magnetic tape for entry into the composition system. In the VideoComp system, the graphic is put on 35 mm microfilm which is [illegible] equipped with full face [illegible] photo-composer is [illegible] digitise the graphic. [illegible] graphic is merged with the text [illegible] outputs the entire page. It is expected that this facility will find wide use in illustrated parts catalogs.

Two important characteristics of third generation photocomposers are the accuracy and reliability. In line casters and first generation phototypesetters, it could not be assumed that if the input typing or paper tape were correct, the output was correct - the machines themselves made mistakes. The point is very important, that a user can properly assume that if the input control tape is correct, the output will be correct. As with computers, if you have proofread the input accurately, you need not proofread the output. This is a major change for those industries using linecasters, and to take full advantage of it, basic production systems will have to be redesigned. In addition, the less mechanical and more electronic the machine, the greater its reliability. Third generation machines use a maximum of solid state electronics, including integrated circuits, and a minimum of mechanics. The performance records of machines like the Fototronic-CRT are excellent and show a minimum of downtime. Installations which were forced to have redundant equipment in the past are now successful without it.

Future third generation photocomposers may find a better output device than the cathode ray tube. A cathode ray tube will not last forever and does require extensive linearity correction circuitry. Development of a laser scanner or solid state luminous scanner would improve the system. In addition, reduced memory costs will allow for greater font and graphic storage. More precise displays will lead the way to half tone as well as line graphic output. However, most important will be the development of better systems, especially easier to use and more efficient software for generating the input tape for the photocomposer. Concurrent with this development, and really a part of it, the industry will learn how to use the full capabilities of the hardware efficiently.

The important characteristics of third generation photocomposers can be summed up as follows. They can store a large number of fonts and instantly produce them in a broad range of point sizes and varying degrees of expanded or condensed styles and in roman or oblique mode. The machines are extremely accurate and very reliable. The ability to output graphics and merge graphics and text to produce a complete output page requiring no handwork makes electronic paste-up a reality. All this coupled with their speed should lead us to the high quality, lower cost complex typography required by our modern civilization.

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Table 1 - Third Generation Photocomposers[1]

Characteristic	Fototronic-CRT	Linotron 1010	Linotron 505	VideoComp
1. Input	Magnetic Tape	Magnetic Tape	Paper Tape or Magnetic Tape	Magnetic Tape
2. Character Storage	Digital	Analog	Analog	Digital
3. Character[2] Capacity				
Primary	256-4096	1024	1016	200-540
Secondary	16,320	--	--	50,000
4. Point Size Range	4-28 (144)	5-18	4-72	4-96
5. Sizes in the Range	50	8	28	33
6. Expanded/ Condensed	Yes	Yes	Yes	Yes
7. Oblique	Yes	Yes	Yes	Yes
8. Typical Character Thruput[3]	460-1500	520-1100	12-65	400-1200
9. Character Generation	dot matrix	raster	stroke	raster
10. Character Resolution (lines/inch)	400-1440	835	650-1300	225-1800

Table 1 - Third Generation Photocomposers (cont'd) Page 2 of 3

Characteristic	Fototronic-CRT	Linotron 1010	Linotron 505	VideoComp
11. Character Positioning	electronic	electronic	mechanical	electronic
12. Line Positioning	electronic/ mechanical	electronic	mechanical	electronic/ mechanical
13. Maximum Line Length, Picas	69 (100)	63	64	70
14. Reverse Film	Yes	No	Yes	No
15. Reverse Leading	Yes	within 48x63 pica page	Yes	No[4]
16. Dynamic[5] Leading	Yes	No[6]	No	No[6]
17. Page Length Maximum	unlimited	63 pica	unlimited	unlimited
18. Rule Generator	Yes	Yes	Yes	No[7]
19. Line Drawings	Standard	Optional	No	Optional
20. Max.Graphic Resolution (1/in.)	720	835	--	450
21. Optics CRT:Film	1:1	1:2	7.5:1	1:2

Table 1 - Third Generation Photocomposers (cont'd) Page 3 of 3

Characteristic	Fototronic-CRT	Linotron 1010	Linotron 505	VideoComp
22. Programmable Input	Optional	No	No	Yes
23. On Line Paper Processor	No	No	No	Yes
24. Microfilm	Optional	No	No	Optional
25. Basic Price	$322,500	$500,000	$100,000	$341,775
26. Software	Harris Composition System, LS1403 (IBM 360); PAGATEXT (Honeywell 200)	Master Typography Program (IBM 360)	Output Modules for IBM 360,1130 Honeywell 200, PDP-8, Spectra 70, Univac 93000	Page Composition (Spectra 70, IBM 360); File Composition and Text Edit/Compose (VideoComp 1600)

NOTES:
1. Currently in use in the United States.
2. Characters selected from secondary access will reduce the thruput of the system while those selected from primary access will not.
3. Rates are based on samples run for the Federal Electronic Printing Committee, specifically Mr. Edwin R. Lannon.
4. If equipped with the full face writing option, reverse leading can be done in the 42x54 pica page. Otherwise, it requires software merge programs or is restricted to the 8 pica window.
5. Dynamic Leading is defined as writing characters while the photographic material is moving.
6. Unnecessary within the page size limitations.
7. Yes, using software routines.

Software Interfaces and Systems Aspects
John W. Seybold

INTRODUCTION:

I should like to make it clear that I am not, by trade or experience, a computer programmer or systems analyst. I am rather a layman who, over the past seven years, has become deeply involved in the management and direction of a commercial operation dedicated to computer composition. (At times this was less of a business enterprise than it was a crusade; it has always been fraught with perils and abounding in research opportunities.) I have had to make major policy decisions with respect to systems and methods, but the implementation of those decisions has been assigned to others. I believe I can claim to have had a great deal of experience in appraising industry needs, system capabilities and in applying software solutions to a wide variety of typesetting (and related data processing) applications, but I recognize that there are significant areas where others who attend this workshop will be much better informed than I and perhaps better qualified to illuminate the topics and issues. Let us hope that I can succeed, however, in identifying the proper areas for us to address ourselves to. I think the underlying theme of my paper can be summarized quite simply: who should carry the ball and where does the goal lie?

I. FRAME OF REFERENCE

I should like to present certain propositions to be considered as a possible useful frame of reference for these discussions. Obviously these propositions are debatable. They simply represent my own considered opinion of the realities of the software situation for computer composition today. I cannot take the time to support them, but in the sessions to come I will be glad to attempt to defend them if this seems a useful exercise to those of you who will be present.

1. There is no software package for computer typesetting today that is not proprietary, with the possible exception of the GPO software.
2. Software packages that have been written and are presently in use may be divided arbitrarily into the following general categories:
   a. hot metal single-pass systems, performing input, hyphenation and justification, with perhaps "allotting" of output between various linecasters.
   b. special-purpose newspaper classified ad programs for hot metal.
   c. photocomposition single-pass systems, performing input, hyphenation and justification, and output.
   d. photocomposition multi-pass systems performing input, printout, storage, update or correction, hyphenation and justification, and output.
   e. photocomposition multi-pass systems performing all of the functions listed in (d) above, plus pagination. Interim photocomposition output as

an alternative to printout may also be provided.

f. interfacing programs which permit the use of data processing techniques prior to or interleaved with the various computer passes.

g. related to (f) above, "edit insert" programs to convert data files into a format congenial to processing through typesetting software.

h. special-purpose data processing and typesetting programs written to meet the requirements of large data file-typesetting applications.

3. Not only are all of the programs as defined above proprietary (except those of the GPO) but they have been written for special configurations of computer equipment, usually in non-portable computer languages. Where they have been written in a compiler language they are probably still not very portable and are quite probably inefficient.
4. With respect to present composition programs, there is also very little universality in concepts, codes, commands, or hardware requirements.
5. Some development activity is still continuing in the field of computer typesetting software. But the major thrust at the moment seems to be in the area of programming for mini-computers.
6. Manufacturers of hardware (typesetters or computers) do not seem to be committed, presently, to major composition software development. Apparently Mergenthaler has a project under way. IBM is still perfecting its existing software package (Composition 360). Harris and RCA are improving their existing programs but apparently the modifications are not visualized as far-reaching in character. There are, as indicated above, some significant software developments in the mini-computer line.
7. I believe there is a need for general-purpose computer typesetting software which can be used on standard medium-scale computer equipment. I do not believe that any present software is sufficient, or adequate, or general enough, or straightforward enough, or versatile enough, although we can learn a great deal from it.
8. I visualize that this software would be used primarily by institutions (whether profit-making, governmental, educational, or eleemosynary) where the justification for the computer installation does not rely upon the typesetting application. The mini-computer route is probably the way to go where economic justification must be found. This is not to say, however, that if the computer installation can be justified (or mainly justified) for other purposes, the use for typesetting applications cannot pay its own way.
9. I do not believe that the cost of the development of adequate computer typesetting software for standard medium-scale computers can be justified as a prudent investment by any one manufacturer or user. The cost is too great, the project is too highly specialized, and the benefits are too uncertain. I do not see that

such development would promote the sale of computers or typesetting devices sufficiently to encourage any one manufacturer to underwrite these costs. I do not believe that any service bureau or software house could gain sufficiently to warrant the investment of time and money required. Typesetting applications will always be highly specialized, require a great deal of dedication, and an intimate relationship with customers. Nationwide computer typesetting service centers are likely to remain a dream and not a reality. If any private organization does launch such a software and systems effort its availability will not contribute substantially to the needed centering down of software approaches. It would probably encourage proliferation of system approaches at a time when the need is for standardization.

10. On the other hand, I feel very strongly that all segments of the "information industry" --public and private-- would have a great deal to gain by the availability of an adequate software package, and a good "system." Hardware manufacturers of photocomposition machines would sell more equipment. Existing equipment would be better utilized. More work would be directed into this area. There would be a better general understanding of the capabilities of the system and a higher level of information interchange could take place. Courses and tutorials could spread abroad an appreciation of the subtleties of the system and experience could be cumulated and shared.

II. POSSIBLE APPROACHES TO THE DEVELOPMENT OF A COMPUTER TYPESETTING SOFTWARE SYSTEM

There are four possible approaches that occur to me:

1. A high-level program could be written in whatever language would appear to be most efficient, for which compilers are generally available: whether FORTRAN, ALGOL, COBOL, SNOBOL, or some other.
2. A new high-level language could be developed especially for typesetting, and hardware manufacturers and others could be encouraged to develop their own compilers for this language.
3. A generalized typesetting language and system could be defined and those who presently offer typesetting programs could seek to provide interfaces between their programs and the generalized language, in the form of "pre-processor programs."
4. A new set of application programs--an entirely new system--could be written in an assembly language. It is this course of action which I recommend. This recommendation is based upon the following considerations:
   a. It appears that no high-level language for which a compiler is generally available can handle typesetting needs in an efficient manner. (This, at least, is what I am told, and my investigation has been extensive.)

b. The development of a new high-level language which would require the creation of new compilers by hardware manufacturers would be unreasonably expensive and an inefficient use of collective resources, especially when there is no reason to believe that such a new high-level language could cope with the problems any better than IBM/360 Assembly.
c. The proposal set forth in (3) above is logical, but it presumes the existence of satisfactory manufacturer-supplied software solutions of a very general nature. I do not believe that the presently-available typesetting programs are sufficiently general, or efficient, or powerful. (If one such program did exist it would be proprietary at any event.) My outline of what such programs should be will, I hope, make this clear. Moreover, it is probably easier to effectuate a fourth alternative than to improvise with a third.
d. If any software system adaptations are to be made, they should be in the mainstream of what is going to happen anyway. Other manufacturers of hardware in the computer field are gradually shaping their architecture in a compatible pattern, and are offering software bridges, or hardware accommodations, to cope, in a very general way, with IBM/360 Assembly. Hence no special software effort would be required beyond that which will occur in the normal evolution of software systems--other than the development of the applications package itself.
e. The IBM/360 series--from Mod 30 on up--is the most common medium-scale computer system in existence today. The 370 will be compatible, program-wise, with the 360. There are no fundamental differences that cannot easily be overcome between 360 programs and those for RCA Spectra 70 (and the subsequent models, for which 360 software bridge programs have already been promised). Other computer manufacturers of equipment of like power and generality (except the large scientific machines that handle long bit strings--the "word crunchers") appear to be bringing their equipment into harmony with the IBM instruction set, or providing emulators or other conversion packages. Moreover, the trend toward micro programming, already well under way, will make it possible, by firmware, simulation or otherwise, for computer manufacturers to enable their products to take on the architectural properties of the 360/370.
f. In addition, in certain programming areas it is possible to program one step removed from 360 Assembly, and to impute to present 360-type computers an architecture they do not presently

possess, but can be given through macro-programming techniques. To do this extensively would place too great a program burden upon those who wished to assemble the programs for their machines, but to do it in certain areas, such as to link to certain operating system features, would enhance the generality of the proposed solution. In other words, a degree of macro-programming can create a more ambient program environment.

III. GENERAL PARAMETERS FOR THE DEVELOPMENT OF A TYPESETTING SOFTWARE PACKAGE

A. The Operating Environment

Multi-programming. Initially computers were used to process one job through one program at a time. Over the years computer speeds have increased dramatically and now in most applications there is a tremendous disparity between the internal speed of the computer's central processing unit and the speed of its peripheral devices. Most efficient computer operations therefore run in a "multi-programmed" environment. The computer memory is divided into several partitions with a priority assigned to each one. Different jobs requiring different programs are run in each partition. If the "operating system" finds that the CPU is out of work to perform in a high priority partition it will automatically switch to the next lower priority partition in order to execute a portion of the job that is waiting to be run there. The net effect is rather like having several side-by-side computers, each working on different jobs. In fact, the key to success in a multi-programmed environment is to have enough different kinds of jobs to do. Jobs which require a great deal of input and output on slow devices (like card readers or computer line printers) are generally assigned a high priority or "foreground" partition, and jobs requiring a great deal of computation but relatively little input and output are given a low priority or "background" partition. In this way the computer can keep its peripheral devices busy and use its "spare time" to do heavy computing. Any computer program can be run in a multi-programmed environment. Obviously, it is most efficient to prepare the programs to achieve a balanced use of the computer and its peripheral devices, but there are no special programming requirements for a multi-programmed system.

Multi-job processing. In a typical data processing installation a large number of special purpose programs, each designed to handle a certain kind of job, are run every day. With the exception of "utilities," such as prints and sorts, seldom will the system be asked to work on two jobs at the same time on the same programs. In a typesetting or text editing situation quite the opposite is true. Typically, there is a very great number of jobs or "takes," all of which must be processed through the same programs. The jobs are all generally small, and many of them are under substantial time pressure. The jobs would have to be "queued" under

normal multi-programming, in order to run through the same programs one at a time, and the system will therefore work inefficiently with much waiting time.

In this kind of situation the way to utilize the computer effectively and cut down the queuing time for jobs is to develop computer programs that are capable of processing more than one job concurrently. The jobs to be processed can be read into the computer and stored on disk. As many jobs as will fit are assigned their own input/output and work areas and are processed according to their priority. Whenever the program gets ahead on one job there is another waiting to be worked on. In a typical multi-programmed operation the computer may work in turn, say, on three different jobs to be run on three different programs. In a "multi-job" environment the computer may work, in turn, on a dozen or more different jobs all using the same set of programs.

Time Sharing. A computer can be a very powerful tool to carry out the wishes of a human who is working with textual material. Since it would be inordinately expensive to give each person his own personal computer with the kind of power required for this sort of operation it makes more sense to let people share the use of one or more large, centrally-located computers. In most scientific applications such time sharing implies letting each user have his own program in the computer to do his own work. In the case of text processing and text editing it means an extension of the multi-job processing described above: a relatively small number of computer programs are on call to be shared by all users of the system.

Both multi-job processing and time sharing require the same kind of programs. In the first place the programs must be "re-entrant." They must be capable of processing even one solitary character from each of 100 jobs in turn. Unlike conventional computer typesetting programs, a re-entrant program must not be modified in any way by the material which it processes. Everything which it needs to know about the work which it is processing must be stored in a separate area for each job.

In the second place, since there is, presumably, at least one other job waiting to be processed which can and should be handled concurrently, time-sharing programs should be able to minimize the computer time it takes to perform any function, even if this means increasing the total time to do that particular job. The total time spent on all jobs should be minimized, not the elapsed time devoted to any one.

Computer programs are not generally re-entrant. It is more difficult to write programs in this fashion, but it is mandatory to do so for this kind of processing. As far as we know, there is only one such program in existence today, which was designed to be re-entrant, and its hardware at the moment precludes it being run in this way; yet typesetting programs, perhaps more than any other kind, would benefit

by this capability. The closest one can come today to such an arrangement is the text editing capability of the IBM ATS(Administrative Terminal System) software. However, this software, complex as it is, does not afford the opportunity to interface in a reactive way, with the hyphenation and justification programs of IBM or any other company, and any such modification of ATS would, I am told, be virtually impossible, or extravagant.

Special opportunities would arise as a result of design which would seek to maximize total throughput rather than individual job throughput. In batch processing of an individual job in a dedicated system, logic must be used for the primary hyphenation decision. A relatively small quantity of exception words can be searched, but a large dictionary cannot be used. Dictionary lookup time, even on a disk, is too great. Yet no logic program, even supported by an exception word dictionary in core, can produce good resuls. Moreover, the "logic" is time-consuming in terms of the compute time involved, since the routine must be quite explicit. But if the I/O time is used for dictionary lookup, and at the same time the main frame goes on to process other jobs in a multi-job processing situation, the amount of compute time is reduced, the program is simpler, and the results are substantially better. Now preferred hyphenation points can be chosen because they can be so indicated in the dictionary store. The hyphenation routine reduces itself fundamentally to a disk-search operation.

Recommendation: It may be seen, then, that our feeling is that the computer typesetting software must be largely re-entrant, and capable of being run in a multi-job environment, if not in a completely time-shared environment. It is further our belief that the operating system should be OS, but a DOS version could be offered if desired. Macros can be used to provide most of the bridge between OS and DOS, with perhaps some routines being re-written if DOS is essential. But the trend away from DOS and in favor of OS seems well established at this point of time.

B. Modularity of Program Design

Programs should be written as small modules which can be linked together to form the complex desired. This makes it easier to write, debug, and modify the routines. It also makes it possible to link together the same routines to form a variety of special programs or to share the same routines between programs. Hence they will take up less room in core. New programs, such as special high-speed processing applications for individual jobs, could be written simply by linking together the desired modules. Moreover, if the programs are written in a re-entrant fashion, once a module has been loaded into a computer core it can be accessed by a variety of programs.

C. Machine Independence

The programs should not depend upon any particular hardware/software configuration. It should be easy to change peripheral devices and it should also be as easy as possible to change computer operating systems (such as from OS to DOS) since these seem to evolve at a more rapid rate than do the computers themselves. Where possible, the programs should allow for an easy interface between the programs and the computer operating environment, but because of certain features of OS as compared to DOS, there are certain chores which can be performed by the operating system itself which otherwise would have to be done by modular routines.

D. Input/Output Independence

There should be no presumption concerning input devices or input "philosophies." The software must be able to cope with any code structure and any format, accepting compatible magnetic tape or transmission. It would help, however, to establish certain conventions with respect to groupings of characters in extended character sets, and also the positioning of typographic command codes. We have some very strong convictions in this area, but since this is a separate topic we shall refrain from developing our line of argument with respect to input conventions.

By like token, the software must be output independent, bearing in mind that as new output devices are perfected, new output routines will have to be written. But they would link to a generalized format which contains all of the information which they would require, and which would make it possible to use their capabilities to the full. Hence the conceptions must take into account not only what existing typesetting devices are capable of handling, but what evolving machines should also be able to do.

E. Terminal Orientation

It seems clear that the ideal system should provide for interaction between the user(s) and the program and computer through convenient terminals accessible by cable within the usual channel limits and also by data transmission. As indicated, for quick response time, such arrangements require re-entrant programs in a multi-job environment under a form of time-shared multi-programming. An interactive system is one which permits a group of users to call for unique selections of text in real time, to make random revisions in the text which permit the user to play back those changes for verification without undue delay. Deletions, additions to text, the examination and selection of particular articles from a file, and other similar manipulations are achieved either by the hardware, or the software, or by a combination of the two. The system should assume some "intelligence" on the part of the terminal, perhaps its ability to perform certain types of functions off-line, but to access hyphenation and justification (and perhaps also pagination) routines in a totally re-entrant manner. Of course this also implies complete reprocessability of the data. At the present time most edit programs that are linked in some way with hyphenation and justification do not permit reprocessability. It is

necessary to go back to initial input, which is cumbersome and inefficient. While typewriterlike terminals may be used, it is obvious that display terminals will provide a much greater editing capability.

F. Hyphenation and Justification

As previously mentioned, this program must be re-entrant, and must be able to be run in a multi-job environment as well as in a batch processing mode. All programs must be capable of being run well within the limits of a 65k computer, in multi-programmed batch processing, which would require even the background programs to run within 32k, with efficient overlays as necessary. A wide variety of type styles should be accommodated, as well as type sizes. Mixing of fonts and sizes within a line should be possible. Unit width values should be adaptable to the requirements of all output devices. I favor a dictionary lookup approach to hyphenation, at least as an option, and I believe the program should be capable of achieving multi-line solutions to hyphenation, in order to offer the best possible solution--far better than a journeyman could achieve within any reasonable time frame. Throughput speeds must be at least at the rate of 100,000 lines per hour, in a batch processing mode. A repertoire of commands should be evolved which handle at least the following functions: quad left, right and center; flush left and right; leader with alternating characters and spaces as specified; handle any conceivable indent in a nesting pattern; set tabular; indents with tabular; tabular with indents; self-calculating column widths; store conditions functions; different levels of hyphenation; different parameters for interword expansion; extensive use of formats, keyboard shortcuts, flags for retrieval; pagination assists, and many other similar functions. Redefinition of all elements must be possible at any time, and the content of the codes should be external to the text stream, being available on disk for reference (under an assigned definition) as required.

G. Edit Programs

These must be interactive, reprocessable and highly flexible. It should be possible to re-order or move large blocks of text. Blanket commands should be possible, such as "search and find" or"search and fix". Error checking, verification of instructions and format conditions should be a feature of all programs, but especially the edit routines.

H. Pagination

Pagination programs should solve page makeup on a chapter-by-chapter basis, achieving the most efficient and most esthetic solution for the entire chapter, and using all commands available for spacing where afforded by any typesetting device. Running heads and folios should be generated, widows avoided, logical page breaks achieved, white space floated or allocated, footnotes manipulated, and art work brought in from digitized storage. Interaction may not be possible from the standpoint of providing to the user something which looks like a page, but human intervention must be built into the system, without the need for human inter-

vention if it is not desired. All problems should be capable of some solution, however arbitrary it may appear to be. "Programming" individual pages should be avoided. It is the function of the pagination program to achieve the best solutions under normal conditions.

I. Output

The same output concepts should apply for all types of output, whether from an on-line printer or from an off-line typesetting device. Generalized output routines should be used, and specific output device programs should be linked to the generalized programs. Throughput speed and device speed must be considered at all times. Reprocessability must be protected, bearing in mind that the output device may be only for interim use.

J. Data Processing

All typesetting programs should contemplate the ability to accept data processing files or to create data processing files from typesetting input. Data processing files should be processible on the basis of the manipulation of the information about the data rather than the data themselves.

IV. HOW TO ACHIEVE THESE PROGRAMMING CONCEPTS

We have tried to suggest that these programs are too ambitious to be developed under private auspices. We believe they belong in the public domain. If this is not possible, we believe they should be developed by a broad consortium of interests. However, those in charge of the development, while sensitive to the needs and requirements of the industry and institutional uses, should not be obliged to play politics, and put something in the system to satisfy everyone, or it would never get off the ground. The modularity of the system will make it possible to make modifications later.

I visualize a not-for-profit body, independent of any other, and certainly independent of government. This organization would continue its work even after the system was completed. It would then start new assignments. It would be responsible for interpretation, communication, dissemination of information, instruction and guidance. It would not try to dominate; it would encourage the flowering of ideas in public and private sectors, and would seek to stimulate such interchange at all levels. Probably another body, to monitor or otherwise keep the agency on its toes, humble and experimentally-inclined, would be useful (if only in an ombudsman capacity) because of the critical and central role this new organization might play.

V. SUMMARY

It is my conviction that good software for computer typesetting does not now exist, and that it will not come into being by private effort. (I also feel that governmental effort, in a vacuum, would be most undesirable.) I have tried

to suggest what some of the elements of a software system might be. Perhaps I am too ambitious. But if the program were more modest then my thesis would not hold, that it is too big to accomplish except by cooperative efforts. Unless we take an ambitious stance there will be a proliferation of inadequate solutions, information interchange will not take pace in a meaningful way; the results of information processing will not be readily conveyed to the possible users, and we shall have lost many of the potential benefits of present-day technology.

Enough time has gone by, enough water has swept over the dam, that we now know enough to design a good system. Equipment is good enough and reliable enough, and economical enough, that if we can bring the right software solutions to bear, we should reap great benefits as persons concerned first and foremost with the widest possible dissemination of information, in the belief that knowledge and understanding will promote progress, peace and justice. Sometimes new institutions need to be created. Old ones may not provide adequate vehicles. There are vested interests. There are inhibiting restrictions. I therefore issue a bold call to the industry, to government, to the educational world--to all, in fact, who have the imagination and courage to go forward--to set aside parochial constraints so that the new technology will truly be a boon.

QUESTIONS FOR DISCUSSION

1. Do you agree that there should be a medium-scale computer solution as well as a mini-computer solution?
2. Do you agree that certain computers can handle typesetting software applications more efficiently than others?
3. How do you feel about high-level language solutions vs. assembly language solutions?
4. Do you feel that present software is good enough?
5. Do you feel that I have overstated the complexities and difficulties, and that it is possible to write good software without making it a major and cooperative undertaking?
6. Do you know anybody who is presently developing, or has developed, software of the sort I have described?
7. Do you accept the notion that such software should be re-entrant and permit interaction as well as multi-job processing?
8. Do you believe that the 360 Assembly language would provide a good point of departure, in the expectation of increased compatibility of that language and developing computer instructional capabilities?
9. Do you rather feel that the time has not yet come to try to consolidate our gains? That perhaps we should let individuality and experimentation run rampant for a while longer with little guidance, or attempt to standardize?
10. Have you any other suggestions as to how we might seek to consolidate our gains?

11. What is your reaction to the broad features of the programs I have suggested? What particular specifications would you like to see set forth? Would you like more detail with respect to the programs I have touched upon?
12. Do you feel that this paper is relevant or that it misses the point? Is it what you want to get out of the conference, or would the discussion of other problems be more constructive? If you feel strongly that this paper would cause the discussion to take an irrelevant tack, suggest your own subjects and propositions.

What the Author Should Know About New Printing Technology*

Victor Strauss

Since the early 1960s typesetting has been in a technological revolution which is still in progress and is far from even leveling off. Now manufacturers of composition systems, publishers and printers, and even some writers have begun to ask how precisely authors will be affected by this new technology and whether it would not be best for all interested in book publishing to get the author involved at this stage of the computer revolution.

The shotgun marriage between printing and data processing

In the late 1950s computer scientists began to apply the computer to composition and in the early 1960s the printing and publishing industry found itself suddenly face to face with the computer. This second great composition revolution differed in its abruptness from the first, which took decades and culminated in Mergenthaler's invention of the Linotype in 1884 and Lanston's development of the Monotype at about the same time. That first revolution was well within the intellectual and technical scope of printing craftsmen whereas the second, the computer revolution, was based on scientific premises that were as new as they were strange to printers.

Almost overnight the composition industry changed from a staid business into one that had received the divine spark of electronics. Since printers were no better prepared for the new technologies than computer people were for the needs of the graphic arts, the results were confusion, frustration because of language differences, and disappointed expectations. But the image makers and newsmongers had a wonderful time. They were the ones who really could enjoy themselves.

Computerized composition is a broad and highly technical subject. I will merely point out some of the tasks and problems without using more jargon than absolutely necessary. One of the newer terms is end-of-line decisions. In traditional line casting the operator looks at the manuscript as he fingers the keyboard, working much like a touch typist. But the Linotype operator must also take care of a number of functions related to the copy and its appearance as well as to machine performance. In particular he must make end-of-line decisions. This means that he must decide whether he should divide a word at the end of a line or space the line out without using the available space for an extra syllable; and if he divides a word he must do this according to the dictionary which is used in

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his composing room, or the dictionary that is especially prescribed for a job.

Computerized hyphenation and justification perfected

The first step in computerized composition was the delegation of these end-of-line decisions to the computer. Now the manuscript is transcribed on typewriterlike equipment which prepares a punched paper tape or, more recently, an encoded magnetic tape suitable for processing by the computer. The equipment may be capable of producing a typed record, known as hardcopy; if it does not have this capability, it is called a blind tape perforator. Now the operator does not divide words at the end of a line but leaves this step to the computer. Typing unencumbered by end-of-line decisions goes faster.

After hyphenation and justification programs had been perfected, the computer was used for page makeup, the operation whereby the pages of a book are determined. Page makeup is known as pagination by computer composition people.

Pagination or page makeup still in its beginning

Page makeup can be relatively simple and it can be quite difficult. Running heads and folios must be inserted, and there are certain typographic rules that must be observed, depending on the design standards of a publisher or a composing room. At the time of writing things are in flux: there are some pagination systems that work well; in certain cases existing programs need adaptations which may be time and money-consuming, but by and large pagination programs of text only, without illustrations, seem to present no major problem anymore.

The next big step will be the computerization of text in combination with pictures. Line illustrations are already included in some systems; shaded pictures such as wash-drawings or photos, which must be converted into halftones for printing, are still in the laboratory or experimental stage, and full-color images are also well advanced even though there are no publicly known operating programs for combining them with text. But there is little doubt in the minds of the experts that pagination programs for combining text with pictures are bound to make their appearance within the next five years.

You can see that the computer, in its attack on printing and publishing, is taking position after position. And it must at least be mentioned that the computer has a great deal to offer in editorial functions such as indexing, extracting, rearrangement of material and even in programmed reorganization of the format. (This last point means changing the format of a book for different purposes or markets, say from hard cover to paperback.) But no other development has played as much on the imagination of the publishing industry as CRT or electronic composition.

The glamour of CRT composition

CRT (cathode ray tube) or electronic composition became practical in the late 1960s. (Cathode ray tube is the name given your TV screen in the physics lab.) The main feature of CRT composition is, as you would expect, speed. Here I must introduce the L/M concept. L/M stands for lines per minute, and it is used to express the relative speeds of different systems. (The line in question is an 8 point 11 pica line, as used in an average newspaper column.) An operator-fingered linecasting machine produces, say, 3-4 L/M; a high-speed tape-operated machine yields approximately 15 L/M and a CRT, incredible as it may sound, can easily deliver 2,000 L/M.

This means that a 100,000-word book can be composed on a CRT in half-an-hour, give or take a few seconds. Project this figure further and you find that you need approximately ten such books per working day, or 2,500 per year if you want to keep this Moloch fully satisfied. And that is at present the greatest problem of CRT composition: to provide the necessary input for the machines.

What does input mean? So far it looks as if the CRT does the job all by itself, as if composed pages jump out of it with no more preparation than Zeus needed when he let Pallas Athene jump out of his head, fully armed and ready to play her role in Greek mythology. Our electronic mythology is just as incredible; fortunately we can get down to earth and try to understand what is really happening.

Like the Monotype caster, a tape-operated linecasting machine, and a number of photographic composition systems, the CRT depends on input before it can produce the final output, the wanted composition. The input for all these systems is prepared in the form of narrower or wider paper ribbons and of various kinds of magnetic tape. These tapes contain all information needed for the operation of the output equipment in a coded form.

Input, the bottleneck of CRT composition

Depending on the nature of the work, input is more or less difficult, or - which amounts practically to the same - time-consuming. A convenient rule of thumb is to assume that it takes about 40 input hours for one hour of CRT operation. In complicated work this time may be increased by 50 per cent and even more.

At present most input is prepared on tape perforators - typewriter-like machines that produce punched paper tape, as already mentioned; magnetic tape input equipment is gaining ground, particularly that rented or sold by IBM, but also by other companies. Some input is arrived at by optical character recognition (OCR) of typed and even printed material, and advanced technologists speak of the

great possibilities of electronic voice recognition which would go directly from dictation to computer tape. I am not up on my reading of science fiction; otherwise, I would know more about man's capability of growing electrodes right out of his skull like the horns of Michelangelo's Moses.

To return to the subject in hand, input depends still more on human beings than on machines, more on the ten fast fingers and the power of concentration of the operator than on the equipment. Another factor that has a considerable influence on input is the preparation of manuscript.

Now we have arrived at the point which is of greatest interest to us as writers, namely how can this new technology be applied to our benefit? How can it help us to improve the quality of our books? Can it really relieve us of some of the drudgery of writing and editing?

These questions cannot be answered without some comments on the whole complex of writing, editing, and proofreading as it is generally practiced.

The writer's literary rights and obligations

The writer's literary rights and obligations are not the same in all segments of the publishing industry, and there is a considerable difference between staff, or employed, and free-lance writers. The members of the Authors Guild are primarily free agents and the following discussion is written with this fact in mind.

The author is, legally if not factually, the equal of the publisher with whom he enters into a contract. From the publisher's point of view he is a supplier of manuscripts. One of his obligations is, according to tradition, the delivery of a completed manuscript, ready for the printer. The publisher may want to do minor editing, and he may suggest, and even request text changes, but the author still has the last word.

In addition to these literary rights and duties the author, traditionally, also has the obligation to read proof. Proofreading, which is technically part of quality control and has the purpose of making sure that the manuscript is correctly duplicated in type, offers the author, psychologically, an invitation to revise, rewrite or generally improve his book. Unfortunately, these changes, known as author's alterations, or a.a.'s, are costly. Publishing contracts provide that the publisher will only pay for a minimum of a.a.'s and the author is liable for all expenses beyond this point.

That's how things are in theory; now let me take a look at our actual practices.

Editing games played in publishing

There are several kinds of editors in a larger book publishing firm. One group, comparable to buyers in department stores, are literary entrepreneurs who have a flair for the opportunities of the marketplace often coupled with shrewd judgment of a writer's capabilities. They are called editor-in-chief, senior editor, or even acquisition editors. Their role in the success of a publishing company cannot be overstated, but they are outside the subject to be discussed here.

When the manuscript is delivered the writer meets another type of editor, often called copy editor or production editor. This person is concerned with the detail of writing, grammar, punctuation, abbreviation, capitalization, or generally speaking with making the text (and illustrations, if any) conform to the house rules. As everybody knows, modern mass society has an ever-growing, almost insatiable appetite for writing. The demand far outruns the supply, if not of persons masquerading as writers, then certainly of halfway competent or really good ones. Not surprisingly, a considerable number of marginal cases, people who under different conditions would concentrate their energies elsewhere, become writers.

Publishers have learned that poorly written books sell less than well-written ones and have developed editing systems to improve the quality of their books. I am referring here more to text books and technical manuals than to other kinds. But even in biographies and other non-fiction books there may be a lot of work for a copy editor. He, or she, must do what the author was supposed to do in the first place: make the manuscript ready for the printer. The edited manuscript either can be sent directly to the compositor or it can be returned to the writer for his approval. Either method has its advantages and its shortcomings. I am told that there are writers who are pleased with the corrections made by editors and who return the manuscript not only with their approval but also with thanks. And since my informants are honorable people there must be such instances. But I believe that most people dislike intensely to have their language corrected, and those likely to accept corrections on their merits usually need them least, because they are the true professionals. But these professionals are particularly irked if they are asked to accept inept, pedantic corrections made by recent English graduates in imitation of their teachers.

The psychological background of these games between the literary governesses and their often unruly charges cannot be pursued here. But what must be pursued is the appearance of the manuscript as it finally arrives at the compositor. It looks like a neatly ploughed field trampled over by a horde of drunks - a real mess. Words and sentences are now crossed out in one color, marked "stet" in another, additions are written in longhand, and directed with

graceful loops or arrows to their proper places; paragraphing is changed, and slips, marked insert at A or No. 1, are clipped and stapled to the pages. These corrections are evils which continue to beget more evils in the course of production. They have a cost-increasing effect on input, and cause trouble during proofreading. Ideally, a manuscript should be perfect, with no corrections at all.

To avoid the back and forth traffic between writer and editor some publishers send the copy-edited manuscript for proofreading. If he has the temperament of a saint he will find this procedure to his liking because liking it will prove that he is far advanced on the way to salvation. If, like most of us, he is an ordinary sinner he will blow his top and feel cornered and abused. Nobody likes to be faced with accomplished facts, and to be confronted with a fait accompli where he has by law and tradition the right of decision is particularly galling to the writer.

If he is young and inexperienced, or just inexperienced, he has a surprise coming: whenever he changes the copy editor's gems to his own language, or, after his anger has died down, to better language, stimulated by the editor's corrections, he runs the risk of having to pay for these changes as a.a.'s. And he will learn to his chagrin that a.a.'s are much more expensive than he thought. (An explanation whould be lengthy, so let me just say that service costs always come very high.)

As you can see, writing, editing, composition, and proofreading are all closely interlocked. Our whole editing and proofreading system is actually based on the dual nature of composition which must now be explained.

The dual nature of composition

All composition is done by assembly. In hand composition the compositor assembles individual type characters and spaces them into words and lines, into paragraphs,and on into pages. More modern methods have changed composition technology from the bottom up, but they are still based on the assembly principle, in CRT composition even more so. This is one side of composition which has of course its own technical rules and values.

If composition were an assembly method like many other industrial processes, say those whereby automobiles are put together, things would be much easier. Unfortunately, this assembly method has also an intellectual side. The compositor must be a literate person. For centuries he was expected to be an excellent speller and sure of his grammar, particularly of punctuation and capitalization. These abilities were, and often still are, necessary because writers are by and large not too attentive to the detail of their manuscripts. The compositor was and still is in many cases as much responsible for the grammatical correctness of composition as for its technical aspects.

For centuries it was impossible to separate the technical from the intellectual side of composition. When Tolbert Lanston invented the Monotype in 1887, he divided his new system into the keyboard and the caster and thereby made the division of the two sides possible. The keyboard was and still is used for encoding a paper ribbon with the intellectual content of the composition. This paper ribbon then is put on the caster where it controls the casting of justified lines consisting of individual type characters. Lanston hoped that writers would learn to operate the keyboard but this wish did not come true.

The separation of keyboarding from casting was applied to the Linotype in the 1930s. Again it was hoped that journalists would operate the keyboards of the TTS (Teletypesetter System) and again these hopes were disappointed. Even though TTS perforators are easier to handle for writers than Monotype keyboards, this function was in practice left to craftsmen who copied text rather than to the writers who originated it. The next experiment in making keyboarders out of writers was made approximately 30 years later. In the early 1960s,keyboards that looked and worked like typewriters, equipped for hardcopy, were used to prepare unjustified tape for the computer. It appeared logical to ask journalists, reporters, to file their copy in this manner but this logic too was short of breath; it got nowhere.

You see that these experiments of the writer as part of manufacturing were repeated by different generations. Here as in other things each succeeding generation had to find out for itself because it did not have the experience of its fathers.

Different people will draw different conclusions from these failures. Mine is that it is impossible to concentrate on anything else when you are writing and that every system which deflects the attention of the writer from his work must fail. I personally believe that that is the way it should be. A writer's job is to write, and to concentrate all his energy on writing. It cannot be the writer's job to subordinate writing to the preparation of input. Here as elsewhere those who want to kill two birds with one stone will kill none and probably smash some windows.

But I also believe that the new technology can be used to help us in our work as writers, relieve us of much of the tedious detail of editing, eliminate time wasted in proofreading, and, not least, reduce the senseless time lag between writing and publication. Much of the new technology is still in flux and can therefore still be influenced in its direction.

The crux of computer composition

The same technological revolution that gave us hot metal machine composition (Linotype, Intertype and Monotype) also

gave us the typewriter. Either development is a departure from hand composition, and different as they are in most respects they have both one new common denominator which did not exist in hand composition: the keyboard as originally used on musical instruments. I have already sketched the several efforts made to combine writing and keyboarding and explained why they all failed. The new technology will change this situation decisively, because it is so flexible, so adaptable that it has become possible to divide the Siamese twins of composition, its intellectual and its technical side. This is the crux of the contribution made by the computer to composition. This truly revolutionary point is, unfortunately, much less ostentatious or ostensible than the fabulous speed of CRT composition. But ever more people are beginning to see that this is the point where the lever must be applied.

Another related point needs mention. A secondary, though quite important reason why it is impractical to use writers for input preparation is that the input tapes must be nearly perfect and that the correction possibilities were rather limited in older systems. Computers differ essentially in this respect; they are excellently adaptable to deletions, additions and shifting of copy, hence to editing. And their main advantage is that the already established text will not be accidentally changed because it is electronically transferred from version to version, which is quite different from passing through composition where it must be rekeyboarded and is also otherwise open to changes for the worse simply by the mechanics of handling. It has become not only possible but also entirely practical to arrive at a clean manuscript on tape and to set type from such a tape without interposition of a new keyboarding. To avoid all misunderstandings, I want to add that it is also unnecessary to introduce codes relating to the technical side of composition during this phase of the work. How the necessary function codes are to be entered is not of interest to writers, but is, rather, the job of systems designers and technicians.

Is proofreading a necessity for the quality of books?

Some authors and editors shudder to think that their books will be printed following the manuscripts with no proofreading. They assume that the final manuscripts for composition without proofreading would be of the same nature as those turned over to compositors under present conditions. But the manuscripts to be used in the future will be entirely different. Then all corrections by writer or editor will be made, and repeated so often as found necessary by a writer, before the manuscript will be released for composition. The quality of manuscripts will be greatly improved for several reasons. One of them is that the time needed for electronic composition from existing input tapes will be reduced from months to days or weeks. This time saving can be invested in rewriting and editing. Secondly nobody will have to work under the pressure of printer's schedules and need to

refrain from rewriting because he is afraid of the expenses caused by the odious a.a.'s.

When the final manuscript is established it is so to speak frozen on the tape. A final transcript of this frozen tape is made least expensively by computer printout equipment, which shows writer, editor, designer and compositor the exact text. No proofreading for content is necessary from then on. There will be no new keyboarding and therefore no mistakes. (Machine errors are so rare that they can be neglected at this stage of our discussion.) There may be an inspection of the composition though, to make sure that it is up to the typographic standards of publisher, designer or printer.

Finally I want to mention that the computer could easily take over some of the most boring and also most time-consuming chores of copy editing. I am referring here to the consistency in spelling,abbreviation, and so forth, which causes so much shaking of heads among our good, hard-working copy editors. Authors can be inconsistent (said less politely: "sloppy") and misspell words or mishandle compounding. Few items are as annoying as the little hyphen. Be consistent! make up your mind, and stick to your decision! Is it copy editor? copy-editor? or copyeditor? As all three versions are defensible and only the bluest of the bluebloods will be immediately offended by any, even the best copy editor is apt to overlook some infraction of these artificial rules and thereby join the ranks of the inconsistents. But the computer is not open to such human weakness; if you instruct it to join copy and editor with a hyphen, a hyphen will join them forever.

To sum up: The new technology in printing, if properly understood, can help us write our books, make our books better, reduce the time lag between writing and publication, and relieve us of much of our editing nitty gritty and all of our proofreading. If we understand what it can do for us we can greatly benefit by it.

A Cost Study of a Computer-Based Information Processing System Using Photocomposition

William G. Cox and Ronald L. Wigington

Introduction

The costs and economies associated with computer controlled photocomposition must be discussed in the framework of a total system. This paper will present cost data from the operating experience of Chemical Abstracts Service where computer controlled photocomposition is being used both as a part of internal processing and for final publication output.

Because various organizations have different environments, different needs, and different overall system structures, the economies provided by the use of computer controlled photocomposition as an output mechanism may vary more from the associated system structure than from the composition process by itself. Even the costs may vary from use of the same composing device due to method of financing (i.e., capital expenditure, lease, service bureau) and the load level over which those costs are spread. Too often, general conclusions are drawn that a particular technique is superior or inferior based on comparisons of uses in environments that are not themselves comparable. Therefore, for this discussion, as much emphasis will be placed on the description of the environment from which the cost data comes as on the data themselves.

The system structure and cost data comes from the experience of Chemical Abstracts Service in using computer systems and photocomposition for the production of Volume Subject and Formula Indexes for "Chemical Abstracts". By using computer controlled composition techniques as a key part of overall system design, it has been possible to achieve operating economies as well as to make possible new forms of system outputs. Further, we expect to improve the speed of processing.

We view computer controlled photocomposition only in the context of an overall information processing system. It provides the means by which data (information) in machine handleable form can be composed and printed in the quality of appearance that humans demand (or at least have become accustomed to in the evolution of printing) without reintroducing a human, error-prone, costly step between processing and printing at every stage of the process. Thus, it is the mechanism that allows the full power of computer-based information processing to be coupled to the art of printing which has played such a key role in the communication and recording of knowledge in all phases of human activity.

Publication Characteristics and System Evolution

The Subject and Formula Indexes are two major indexes produced each six months (a Volume period) for the issues of "Chemical Abstracts". The Subject Index contains both concept and compound entries with citations to the abstracts published

during the Volume. The Formula Index provides entry to the same information by means of molecular formulas. The range of typography requires 768 characters including Roman and Greek alphabets, italics, bold-face, various combinations of subscripts and superscripts, and many special symbols. Line drawings for chemical structures are also interlaced with the lines of text. The information is formatted in 3 columns per page with an average character density in the range of 15,000 - 18,000 characters per page. In 1967, these indexes (for Volume 65, CA) were produced by a system which included computer supported working files with line printer output for work sheets, manual alphabetizing, Varitype composition and corresponding printing methods. Unit cost data are given for these methods as used in producing the indexes for Volume 65 of "Chemical Abstracts".

In 1968, a new system was introduced for producing the Formula Index. Two innovations were included. The working files for the Formula Index portion of the information were transformed into a form that could be ordered by computer, according to sorting rules appropriate for molecular formulas, and the manual alphabetizing was eliminated. Composition at both galley and final page stages was done using photocomposition. The photocomposer produced single column output and photographic processing was used for assembling the final page photographic masters. At this stage of system development, the Subject Index was still produced by the former method. Data are given for the mixed systems which used computer controlled organization and photocomposition methods for the Formula Index and Varitype methods for the Subject Index for production, in the first half of 1970, of Volume 70 Indexes.

In the fall of 1970, a new integrated system was completed which has two major components. A new index support processing system was introduced at the beginning of 1970 which used photocomposition for output of work sheets from generalized index support working files. The other part of the new system was the index publication system which selected material from the working files and ordered, formatted, and composed it totally under computer control. In the first use of this system for production of all Formula and Subject Indexes in the fall of 1970 for CA Volume 71 material, both galley and final page were photocomposed. Data are supplied based on the experience of index production for Volume 71 indexes. Extra start-up costs and training costs have been excluded so that the comparison is not distorted and is consistent with the production rates we are observing as we process Volume 72 material.

These steps in system evolution illustrate the long term development program which is transforming Chemical Abstracts Service from a traditional secondary publication activity into an integrated computer-based information system which has a variety of outputs, both printed and computer readable. In this effort there are several principles which are guiding the design:

- Information should be handled as units which are defined and recorded in the maximum detail required and available for all uses and should not be input or processed in terms of specific outputs until the selection for packaging stage.

- These information units should be organized as a data base, not as special purpose files in a process dominated system.

- At the input and output, the system design must accommodate changes in technology which enhance the performance and economies of the overall system. Thus, the characteristics of input and output devices must be as independent as possible from the form in which the information is stored.

- Organizing and formatting for each specific output use must be defined algorithmically so that when data is selected from the data base it can be appropriately prepared for output with minimum human intervention, if any.

Thus, the CAS processing system which is being developed has three major manufacturing components: Input, Data Base, and Output.

Photocomposition Facility

The present CAS photocomposition facility is an IBM 2280 film recorder that has been modified to enhance its character generation capability[1]. It is controlled with an IBM 2840 control unit which operates as a standard peripheral on a selector channel of our IBM 360/65. Character generation is done by means of short stroke display subroutines. The characters were designed by CAS using a 2250 CRT display terminal as a character library maintenance aid. The character library is stored on disk and transferred to the 2840 controller memory as needed. The 16K byte memory of the 2840 will hold approximately 75 characters. Look ahead queuing on character subroutines needed is done to insure that the composition process is output device bound and not character library access bound. The composer will output approximately 55 6-point characters per line. On formatter material the composition rate is approximately 1200 characters per second. The composer also has general vector drawing capability which is now used only experimentally.

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1. "The Application of the 2280 Film Recorder to CAS Processes", D.F.Hule, Eighth Chemical Abstracts Service Open Forum, Chicago, Illinois, Sept. 12, 1967. Available from the Public Relations Department, Chemical Abstracts Service, The Ohio State University, Columbus, Ohio 43210.

Cost Data

The specific object of this cost study spans all three of the major CAS processing system components: Input, Data Base, and Output. It begins at the initial input of index information after the intellectual analysis is completed. The form of the information at this point is dictation tape produced by indexers. The cost model follows the steps of processing through initial input and file building, unit verification and correction, galley production and review, and production of final page film for use in printing. Because of the present level of development of the total system, line drawings for chemical structures are stripped-in during the final photoprocessing steps. Future systems will perform the merge of text and drawings electronically.

In determining the CA Volume Index to represent the cost of each of the three methods, the final Volume (Volume 65 and Volume 70) for each of the first two methods were chosen. This would reasonably represent the optimum cost efficiency for these two methods. In contrast, this cost performance is being compared with the processing cost experience at an early stage in the introduction of the current integrated system. Thus, we feel that this is a conservative estimate of improvement.

Several assumptions and adjustments were made in order to have as valid a basis as possible for determining the impact of the use of computer processing and photocomposition. Over the period of the study, the general indexing practices and average indexing density have been fairly stable with a slight tendency for an increase in the total number of substance and concept access points. Costs are stated as unit costs (per original document processed). Indexing and index production are activities separate from bibliographic or abstract processing so there is no overlap or shared costs involved. So that inflation does not invalidate the comparison, all costs were adjusted to 1970 levels based on the cost of living index.[3] Costs associated with additional outputs at galley and final page stages were excluded to the extent possible. For example, the

[3] Bureau of Labor Statistics, Bulletin 1660-27, October 1969, supplemented by monthly updates from Bureau of Labor Office, Columbus, Ohio.

additional production costs for the Registry Number Index[3] and the Index Guide[3] are not included once they are split from the integrated processing stream. However, the very small costs for the HAIC[3] segment of the Formula Index, included in Volumes 70 and 71 but not in Volume 65, and any additional cost for printing Registry Numbers as part of the relevant entries in Volume 71 but not Volume 65 and 70 of both the Subject and Formula Indexes, could not be separated from overall cost. To the extent that any of these differences biases the result, the effect is toward a conservative estimate of improvement.

While the number of documents indexed increased over the period of study (Volume 65 - 110,913 documents processed; Volume 70 - 120,933; Volume 71 - 131,383), the change was not of sufficient magnitude to make any fundamental difference in the per-unit processing costs, due solely to volume of material handled.

In Table I, cost data are given which are listed to correspond to the major processing steps involved in the production of these indexes. The three columns represent the evolution of methods outlined above. These costs include direct labor, equipment rental, capital equipment depreciation and all standard overhead costs. The processing steps are listed in "open loop" order as the material would be processed. Recycle costs for correction

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[3] --The Registry Number Index is a new index which provides access to the Subject and Formula Indexes by means of Registry Numbers, which are unique identification numbers assigned to substances by the CAS Chemical Registry System.
--The Index Guide is a compilation of cross-references, index notes and diagrammatic chemical formulas for CAS Subject Indexes.
--The Hetero Atom in Context Index (HAIC) is a listing of molecular formulas ordered on atoms other than carbon and hydrogen and provides an auxiliary entry point to the Formula Index.
--For further information on these indexes, see:
. "Some Programs and Plans of Chemical Abstracts Service", F. A. Tate, Associate Director, Twelfth Chemical Abstracts Service Open Forum, New York, New York, September 7, 1969. Available from the Public Information Department, Chemical Abstracts Service, The Ohio State University, Columbus, Ohio 43210
. "Combined Introductions, Subject, Formula, Ring Systems, HAIC Indexes to Volume 66". American Chemical Society, 1968.

of errors are included in the relevant steps, not separately broken out. Thus, the unit costs are on a net throughput basis.

Discussion

It is clear that, on an overall per-unit processing basis, the cost of index information handling has decreased as the production system has evolved into an integrated system based on computer processing and photocomposition output. However, it may be useful to examine some of the cost changes in individual processing stages and to comment upon some of the changes in the man/machine interface.

Even with the high degree of computer involvement in the system and without including the costs associated with the intellectual analysis required to derive the index entries, personnel costs, professional and clerical, dominate the overall cost. Thus, the major targets for savings are in providing a system environment in which people can be more productive. In the case of this production system, more productivity is achieved in two ways. One is to so divide the work between man and machine that man concentrates on what only he can do and the machine handles the repetitive and algorithmic processes. The other way is to retain and retrieve intellectual work so that once done and verified, it can be reused where needed in future processing. This is the only way to make significant headway in coping with the need for processing increasing volumes of information.

In Data Sheet processing, which is the unit-by-unit input and review of index entries, we note that computer controlled photocomposition causes an increasing cost for Data Sheet composition and output. This is due to the difference between line printer and photocomposer output. However, the overall processing cost at this stage decreases. Some of the factors which influence the trend will be noted later.

At the Galley Processing stage, the manual alphabetizing process has been eliminated and galley composition cost has been drastically reduced. This reduction is mostly due to the elimination of the rekeyboarding step (Varityping) and associated processing. We note that the editing cost has increased. This is due to a continuing transient of becoming accustomed to the new system. The processing of Volumes 72 and 73 will provide more experience on this aspect. Moreover, this editing is a target for further cost savings in that machine system editing aids in the Data Sheet stage will allow us to reduce the professional effort at this stage. The editing effort at this initial use of the new system is, in part, a verification that the machine system can provide the support necessary to enable complete validation of index entries at the Data Sheet stage.

TABLE I
Volume Index Production System
Unit Cost Per Document Processed

	Volume 65	Volume 70	Volume 71
Data Sheet Processing			
Keyboarding	$ 2.07	$ 1.50	$ 1.44
Chemical Registry	6.89	5.00	4.62
Data Sheet composition & output (computer)	.55	.72	.83
Content checking & editing (chemist)	3.36	3.06	2.61
SUBTOTAL	$12.87	$10.28	$ 9.50
Galley Processing			
Alphabetize	$ 1.03	$ .36	eliminated
Galley composition	2.48[1]	1.48[3]	$ .60[2]
Editing	.58	.51	.69
Keyboarding	.83	.21	.58
SUBTOTAL	$ 4.92	$ 2.56	$ 1.87
Final Page Composition (in column form)			
Composition and photo-processing	$ .06	$ .19	$ .16[4]
Editing	.04	.03	eliminated
SUBTOTAL	$ .10	$ .22	$ .16
Editorial support (including control)	$ .61	$ .44	$ .41
GRAND TOTAL	$18.50	$13.50	$11.94

[1]Varityping and photographing
[2]Computer controlled photocomposition
[3]Mixed
[4]Estimated, based on Volume 70 Formula Index experience

The "final page" composition stage is a trivial part of the cost. The output in all three cases is column composition on full sized film which is later assembled into page masters for printing. In the Volume 70 and 71 cases, the Formula Index actually is composed from our magnetic tapes by a printer using Photon equipment rather than prepared through our IBM 2280 photocomposer. The costs for the processing to the final page column form by the contractor are included in the figures in the table. The ability of a printer to do this from the magnetic tapes which we would ordinarily input to our photocomposition process, and had done in previous Volumes, is an indication of the "device independence" of the design, one of the fundamental characteristics sought in the development. We expect that the output from this system will be able to be readily handled through a wide variety of photocomposition equipment.

The man/machine factors which impact on the processing include both advantages and disadvantages. To assist the editorial work, data from several sources, not all of which will be printed in the current index, are brought together at Data Sheet and Galley stages so that index entries can be verified on a unit-by-unit basis rather than to have to depend so much upon context edit at the Galley stage. Previous verifications of compound names in earlier volumes are output along with current data. This substitutes for the context of neighboring entries at the Galley stage. The Registry System provides the unique identity link to relevant data for this purpose. In comparison to Data Sheets produced on a line printer with a limited character set (even though it may be a 120 character chain printer), the full character set, available through photocomposition, aids editing. Expansions and conventions necessary to represent the full character set on a limited output device are unnecessary, and the effort necessary to interpret them is eliminated. As an opposite influence, since more data is presented on the Data Sheet, more data is reviewed for each unit. The overall net effect of these factors is improved cost performance.

As a by-product of this system at a very small added output cost, magnetic tape files of the information processed will become available. At this time, it is not possible to place an accurate value on this output. In time, it will become an important revenue source to support the preparation of the data. At this time, however, these factors cannot be included in a value/cost analysis. Much more experience is needed with machine readable index files to learn how to use them effectively.

Conclusion

In the situation described in this paper, photocomposition coupled with an integrated computer processing system allows significant economies in processing. Better integration between processing stages is now possible as compared to the older Varitype methods which require a rekeyboarding

effort between the Data Sheet and Galley stages. More machine aids can be made available to decrease Data Sheet and Galley review work.

We expect that processing will be speeded up so that indexes can be put out on a more timely basis and it becomes practical to achieve the desired parallel processing of abstracts and index entries derived in a single analysis. We do not yet have enough data to make any accurate estimates. We are just finishing the processing of Volume 71 material and, as always, the initial set of information put through a major new system takes longer to process while we learn to schedule and control the work. However, the initial processing stages for Volume 72 material are being completed more rapidly and Volume 73 material is already beginning to enter the pipeline. We also have noted that serious bottlenecks in processing in past systems have cleared up. Both of these indications give a good prognosis for speeding up processing rates.

As it becomes possible to further expand the scope of total system integration, combining abstracting and indexing in a single analysis step and, where practical, extending the machine handling to link to primary publication processes for input savings, we anticipate further benefits from computer-based information processing using photocomposition for output to human readable form.

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Computer Composition Economics
Harold F. Drury

I was rather taken with John Seybold's Introduction to his paper on Software Interfaces and Systems Aspects. It tells us something about the author and his experience but more importantly sets a stage wherein he as principal actor states he is a layman but as a businessman has become deeply involved in a business enterprise dedicated to computer composition.

So in my introduction, I'd like to tell you who we are and what is our interest in participating in a program such as this.

I head up the Printing and Publishing Division in the Bureau of Domestic Commerce in the Department of Commerce. Specifically, we represent in the Federal Government the 15 printing and publishing industries and are concerned with their health, their printed products and their manpower. Secretary Stans puts our mission this way: "Promoting progressive business policies and growth."

We enjoy a unique position in government and, at the hub of economic activity, we observe many things. Some of these need emphasizing repeatedly so we can properly evaluate the impact of new technologies and its relation to health, profitability and growth of our industries.

Initially, let's treat these 15 industries as a major group which in effect they are, printing and publishing -- newspapers, periodicals, books, book printing, miscellaneous publishing, commercial printing, engraving and plate printing, business forms, greeting card manufacturers, bookbinding loose leaf and blank book manufacturers, photo engraving, electro-stereotyping and typesetting.

In annual shipments, we approach 25 billion dollars; if you rate us with the 20 major manufacturing groups in the U.S., we're 10th in value of shipments, 8th in value added by manufacture and 7th in value of payroll. We're a big important segment of GNP, with a number of our industries growing faster than GNP. Over one million people are employed in printing and publishing.

Now what are the characteristics of these industries? Long established, some going back to the founding of this country, stable in growth and in employment, directly tied to GNP or growth of the Nation. All characteristics that make predictions easy. No two are alike either in composition, product produced, or sources of income. Newspaper publishers get 71 per cent of their income from advertising, magazines 66 per cent, book publisher zero. So two of our three publishing activities are advertising oriented, while a third uses advertising to sell his product, books. Four of our industries render valuable services to printers:

bookbinders, typesetters, photoengravers and electro-stereotypers. Three of our industries specialize in unique products, business forms, greeting cards and looseleaf and blankbooks and our big commercial printing industry, big to the tune of almost eight billion dollars in 1970, produces a wealth of printed products for everybody.

When I entered the printing business in 1937, the index of union hourly wage scale for all workers in the printing trades stood at 37.0; for book and job printing, 36.8; for newspapers, 37.6. By 1950 this had become 75.1 for all, 74.7 for book and job, 76.3 for newspapers. By 1960, 106.3 and 1967, 131.9, 133.1 and 129.9. So in my business lifetime, I have seen wages in our industry increase over three and one-half times in a period of thirty years.

If we look at the wholesale price index for 1935 to 1967, a thirty-two year span, this index rose from 43.8 to 106.1, an increase of about two and one-half times. If we place this within the context of a group of intensely competitive industries, facing a continual skilled labor shortage, we see why the printing industries are involved in a technological revolution or evolution and why we are interested in computerized photo typesetting.

Some other observations. Offset printing became the dominant printing process about 1967 with web today probably accounting for one-third of this total; this did not just happen. It was forced upon the printer as the most economical method to produce a printed product.

We had two offset printed dailies in 1961 and 580 or about one-third of all dailies printed by offset by 1970. By 1978 ANPA predicts 1376 by offset, 184 by letterpress. Weekly plants printing by offset went from 500 in 1962 to 5069 in 1970. Again, this was not just a happening or an accident. Newspaper publishers in their scramble to remain competitive with other advertising media have had to battle rising costs in the back shop operation just as has the commercial printer. It almost goes without saying that most web offset newspapers are set by photo composition. The marriage of photo typesetting and offset printing has been a good one and will continue to be so.

Let us now look at specific industries that are large consumers of type. The newspaper, magazine and book publishing industries, publishers of catalogs and directories and commercial printers producing direct mail or advertising printing. In each area we have seen continual growth in the '60s and would expect certainly for the early '70s a similar growth.

Specifically, what is happening within these industries?

Newspapers - for 1970 ad linage down slightly but dollar revenue up over last year. Intense competition with radio, black and white TV, color TV, direct mail for the ad dollar.

Now with CATV and EVR, what next? Worse than that, with the growing introduction of the four-day week, growing use of second homes or vacation homes, the newsboy is disappearing, making distribution of newspapers increasingly difficult. Traffic congestion in the large cities make the evening newspaper a late morning. Facsimile in the home, fascimile between publishing office and satellite plants are in the future.

Fortunately, the newspaper industry is innovative, aggressive and adaptable. A publisher doesn't become enamored of a particular printing process as many commercial printers are.

Magazines - increasingly devoted to special interests. Standard Rate and Data Service list 61 major classifications of consumer and farm publications. 93 magazines offer geographic and/or demographic editions.

In the business press, about 130 major classifications with about 3500 magazines listed.

More magazines printed by offset. In the period 1963 to 1967, the Census of Manufactures placed dollar volume by offset at over double for the earlier year with a decline of about 11% for letterpress for the same period.

Needless to say, with offset goes photo typesetting.

Certainly the magazine publisher who gets two-thirds of his revenue from advertising is watching very closely the same developments the newspaper publisher watches - CATV, EVR. Facsimile in the home, in business. Certain general purpose magazines like Life and Look are being scrutanized. Are the public's tastes changing?

For the commercial printer, increased use of computerized typesetting, automatic fiber processors, automatic plate developers, mechanized or electronic stripping, electronic controlled presses, automated binding equipment, computer controlled handling and mailing. Publishers of catalogs and directories saw a 40% increase in product shipment for 1963 to 1967.

In short, a revolution for the '70s. Beyond the next ten years, a whole new ball game.

But, as I said in the beginning, we are here to learn, to observe, and to help our industries to become aware of the future. And we would agree with Art Gardner when he says "the future isn't what it used to be."

Knowledge--of Machines and Men

Frank Cremonesi

The great, all-pervasive fact of our time is burgeoning knowledge. All that man has ever learned now doubles in less than a decade. This fact affects every phase of our lives: our businesses, our personal affairs, and our education in the broad and narrow sense. The casualty rate of information today is greater than at any time. A process hailed as revolutionary in 1960 is obsolete in 1970.

In the composing room the fact of rapid change is no less true than in any industry. The year 1947 saw the coming of Harris-Intertype's Fotosetter, setting type using light and film negatives in place of lead and brass matrices. The Fotosetter, a converted Linotype, retained the circulating-mat principal of Mergenthaler's linecaster.

Within ten years the Fotosetter was made obsolete first by Photon, then by Linofilm. Photon was first to discard multiple mats for a disc containing 16 faces of type that could be enlarged to 12 different sizes - from 6 to 72 point.

The Mergenthaler Linotype Company followed closely with Linofilm, capable of setting phototype in 18 different type faces, each face set in six different sizes. But Linofilm represented a major breakthrough in that it harnessed the 20th Century science of electronics to typesetting. Thus, the printer became a relative of the radio and television technician, illustrating the pervasive quality of modern knowledge.

In 1963 the formerly staid and unchanging composing room was again subjected to a major invasion. The computer was introduced to perform some of the basic work of typesetting which had been "black-book" secrets of the compositor for 500 years. Today, seven years later (December, 1970), the impact of computer is greater in its promise than in its performance. Computer functions are still limited for the most part to the hyphenation and justification of type, and to the occasional gushing out of stored codes. While justification and hyphenation represented basic compositor skills, assigning these tasks to the computer may best symbolize the promise of computer. For reduced to elementary computer calculation functions, hyphenation and justification represent the simplest possible work the computer can perform. At present the potential of computer in the composing room can be likened to a new land only just being explored.

In 1967 the final composing room development was achieved with the coming of the Cathode Ray Tube (CRT) typesetter. The CRT eliminates entirely the negative mat of alphabetic characters, relying completely on electronics to generate characters, to set type, and to make up type into pages or forms.

The coming of the CRT typesetter probably best illustrates how science sometimes far outstrips the capability of the men it chooses to serve. For undoubtedly it will be some years before sufficient know-how and software is developed to make truly efficient application of Cathode Ray Tube typesetters to present-day printing and publishing demands. But the Cathode Ray Tube typesetter can be considered the final composing room development - at least in our generation - because it represents an accomplishment by the most advanced electronic science that has moved so far ahead of the printing technician, it must now wait for an advance of understanding. Like the rabbit, further typesetting machine development must sleep while slow crawling mankind catches up.

However, before proceeding too far afield, one important typesetting function should be noted in connection with this panoply of typesetting advances: the initial keyboarding of copy remains a manual operation. And it is not a reckless prediction to suggest that this first step in typesetting will always remain a manual operation, never to be mechanized. To be sure, keyboarding is being made more efficient with new, highly technical electronic keyboards that incorporate keyboarding shortcuts. In addition some important human failings in keyboarding are being effectively dealt with by introduction of Cathode Ray Tube editing and correcting devices. Combining the keyboard with the computer, one key stroke by a tape perforator operator can cause the computer to give forth as many as 125 codes. But the entire pyramid of technological design for the composing room still rests on the foundation of the touch-typing trained, five-finger human hand.

Incidentally, in connection with the typewriter keyboard, it should be mentioned here that all the scientific studies of the typewriter keyboard find it to be most inefficient. The present so-called standard typewriter arrangement of keys applied to all tape-producing keyboards today has been found to be relatively difficult to learn, creating a high fatigue rate with its consequent high error rate. In company with computers and Cathode Ray Tube typesetters, the typewriter keyboard can be likened to a space ship equipped with a coal-fed boiler for motor power.

While all industry is being subjected to the onslaught of knowledge, the application of modern technology to printing - or more particularly to typesetting - presents a special condition. This is the fact that a skilled craft is being automated.

Mention of automation generally brings to mind such industries as automobile, steel, coal mining, or telephone communication. These are industries employing relatively low levels of skill. However, when applied to printing, automation comes head-on with two significant factors it is not called on to cope with in any other industries as a rule. These are:

1. The work to be automated entails a high degree of human judgment, difficult, if not impossible,

to program into a computer.

2. The men sought to be displaced are skilled craftsmen, well trained, intelligent, articulate and well organized. They are men who have served an apprenticeship training period equal in time to any profession, and their skills are in a state of constant improvement with experience. They are men steeped in the art of producing printing who have mastered a myriad shortcuts and "tricks-of-the-trade". The machine, then, whatever its level of complexity must remain forever subordinate to the man. The machine will remain the printer's tool to produce printing and will never be his master. And the machine will produce printing only when guided by the printer with his human judgment capable of distinguishing between an electrical impulse and a well balanced page of type.

The question is frequently put - and revived with each new design concept: "Can the printer's skill ultimately be automated?" No doubt some of these skills can be, and have been, automated. But when we approach the problem of programming the problem-solving choices at the printer's disposal, we enter a world of unlimited computer space, left open-ended to provide for each nuance and improvisation that may be required by the demands of the trade.

Nevertheless, as science continues to send up its offerings, the dilemma of choices deepens both for the printing plant owner and for his printers. The owner frequently concludes that the cost of change cannot be justified by resulting efficiency benefits. But despite this judgment, he often finds himself compelled to invest in change because a rival has installed new equipment and has begun to attract work away from his plant.

As pointed out by the eminent economist Professor Sumner Slichter, in our competitive industrial society, there is no way of balancing the costs of changed production methods against the benefits. In any case, installation of efficient machines increases fixed costs for the adventurous owner. He finds he can no longer easily tolerate seasonal fluctuations of work; he cannot lay off machines or send them on vacation; he continues to pay for idle machines.

One computer manufacturer advertises his wares with these words: "[It] never slows down, never gets tired, never catches cold, never forgets what to do." All this may be true, but of equal concern to the employer, not mentioned by the manufacturer, is that the computer handles wrong information just as efficiently as correct; that it may not catch cold but develops its own special malady unless kept in a temperature controlled, humidity controlled environment; that it may not take off sick, but it will continue to collect its pay whether it works or not. Finally, the computer - or any machine, no matter how complex - can perform only that which its operator is capable of instructing it to do. The degree of efficiency of any complex equipment in the final analysis

is measured by the skill of the operator and, in the case of printing equipment, the degree of skill of the printer determines the degree of return from investment.

Automation, or technological improvement, for the working printer means,at the very least, retraining; at the very most, losing his job--and possibly losing the opportunity for any job.

Indeed, to every member of every union, the mention of automation conjures up the awful specter of Appalachia, the highly automated coal mining industry existing in the nation's most deeply economically depressed area; the social consequences of uncontrolled automation. For any union member (indeed, for any human being), any system of production must be resisted that can result in human discards, in wrecked hopes, in impoverished families.

It is a social truth that any force will generate rebellion if it threatens men's achievements and their hopes. In a democratic society, rebellion can take many forms short of blood-letting. We resist buying color TV because the price is too high; we vote against candidates for office who espouse unacceptable values; we join or we refuse to join clubs, churches, unions, and political parties. Indeed, this freedom to resist, to rebel, if you please, this system of built-in safety valves has been the strongest pillar in the structure of our democratic society. The history of our democratic experiment is packed with the refuse of rebellion which has occasionally caused it to veer from a steady course but has never affected its basic structure. To be sure, some democratic decisions have been based on fancy rather than on fact. It is, of course, immaterial whether the facts are known if men believe them to be different.

Automation embodies the promise of a better, fuller life for all mankind. Yet automation also contains all the ingredients generating rebellion. It threatens the even tenor of men's lives; it portends,and actually has created, poverty for many; it is difficult to understand. The intelligent course to be followed with the introduction of automation or new technology would seem to be clear: eliminate the threat and bring about understanding. This may appear to be an over-simplification of solutions, but the problem is not solved when management takes the implacable attitude that it has a sacred right to introduce any technology without "interference" from any source. It is an attitude that can generate only rebellion and that could ultimately result in disaster. To the workman, this attitude can be as irrelevant as the hangman about to open the trap door telling the condemned "this will hurt me more than it hurts you."

An enlightened attitude of concern on the other hand creates the highly desirable condition of many men cooperating to achieve a desired goal. This enlightened attitude of concern that is sought and encouraged by the International Typographical Union offers the closest to a guarantee that every new piece of equipment will work to its utmost degree of

efficiency. And the ITU can point to numerous instances of cooperation leading to successful conversion.

Nor does the ITU make enlightened attitude a one-sided requirement. Since 1956 the union has conducted a two-pronged program of education in its effort to bring its membership into harmony with today's changing trade. One phase of the program has taken the shape of a school where new machines, new processes, and new concepts are explored and taught. The unique quality of training offered at the ITU's Training Center in Colorado Springs is that it applies the know-how of skilled craftsmen precision-honed by 500 years of accumulated experience to the new methods. It bridges the faltering and stumbling inherent in novelty, and teaches production of quality printing with new skills and original techniques. It treats new machines not as monsters to be destroyed, but as new tools to produce better quality printing. Since 1956, a total of almost 5,000 ITU members have been trained at the Training Center. Many of these return to their home towns to set up local training programs bringing knowledge of advanced technology to the remotest printing plant.

Since the beginning of the program, over 30,000 ITU members (one-third of its working membership) have received training in new processes, arranging from tape punching to computer programming. These men and women, for the most part, are now performing work unknown to the composing room a generation ago.

In short, the ITU is telling the world, "Printing is our chosen field; it is the work to which we have committed our talents and from which we expect to earn fulfillment of our hopes. Printing for the union printer is his native land, which he wants to build to a flourishing prosperity and to which he wants to contribute his best experience and talents."

How has this position of the ITU worked out in actual application? For the ITU to say all has been smooth transition everywhere could hardly be called accurate since we are dealing with human beings, and could easily be dismissed as self-serving propaganda. And those employers, who regard striving for a measure of security in the transition to automation as nothing more than stubborn resistance to progress, let us cite some figures which offer a view of the direction in which the industry is moving.

At the Convention of the National Association of Photo Lithographers in September,1969,in Chicago, an economist for the Harris-Intertype Corporation reported that the amount of printing produced in the United States was expected to double in the ten-year period from 1960 to 1970. The figure has been confirmed in the November, 1970 issue of Printing Magazine in a study conducted by the Heidelberg Press Corporation's Sales and Service Organization. This manufacturer reports the value of shipments made by the commercial printing industry has risen to an estimated 25.7 billion dollars, up from 12.3 billion dollars in 1958. The most significant increase came

from the more technologically advanced lithographic branch of the commercial printing industry which tripled production during the same period, starting at 1.36 billion dollars in 1958 and rising to an estimated 4.12 billion dollars in 1970.

Now read these figures in context of a report from the U.S.Department of Commerce released in April, 1970, in which this department reported that the printing and publishing industry now employs 1,091,000 persons in the United States, an increase of 20% over 1960.

An increase in production of 100% achieved by an increase in number of employees of only 20% probably best dramatizes our time in the printing industry and it says a number of things:

1. Transition to new processes in the past ten years has been smooth and unquestionably fruitful.
2. This degree of success in increasing production was certainly contributed to by the ITU's cooperation in the form of training and dissemination of knowledge of new processes.
3. Six men producing twice as much as five can be accomplished only with modern technology. Six equals two times five can be construed in many ways but it obviously cannot mean that the ITU is opposing progress.

Printing is one of the last of the highly skilled trades. Printing like no other element in our modern complex society is intimately involved in the daily life of every individual. The six-year old learning to read, the college student studying for a career, the adult scanning stock market quotations, the retired couple analyzing the latest social security benefits and, finally, the minister reading the burial service - all rely on the printed word as the final authority.

And in the United States, probably more than any other nation on earth, Americans are accustomed not only to the ready availability of authoritative printing in every field, but they are also conditioned to being served printing of high quality - correctly spelled, pleasantly balanced and clearly printed. Quality in printing is inseparable from skilled craftsmanship. And skilled craftsmanship in the United States is inseparable from printing.

Therefore, the promise offered by the skilled organized printing craftsman is not only that the new technology will work, but also that printing will advance to greater markets and to new high levels of quality. In this way, only, can the working printer benefit, can the industry benefit, and can America benefit.

From One Service Company to the Others and the Industry
Ronald L. Henderson

This Workshop on Computer Photocomposition has an impressive list of attendees from a broad spectrum of the Industry - it therefore offers us the opportunity to discuss a question which in my opinion is of key importance to us all. The question is: how do we in today's economy preserve for the benefit of the information publisher those members of the computer information processing industry who deserve to survive because objective analysis show that their services are of benefit to the publisher and the public?

Before exploring the question of how, we might first answer the question of why. Other than our bias (there are several service companies represented) there are several major reasons why this industry should be helped to survive and even spurred to flourish:

a. Provide a unique service - Companies such as Publicate provide a unique service to the information publisher in today's market place. This service should help the publisher, be he large or small, survive the trauma brought on by the new technologies for information collection, processing and dissemination. As we have all read many times in the last few years the collection, organization and dissemination of information will some day be primarily performed without going via the printed page.

   This must happen as our vast quantities of recorded knowledge continue to explode to the point where man can only absorb those things directly relevant to his interests. This selection of directly relevant material will require some automated method of identifying, organizing and distributing the information requested by each individual on a tailor-made basis. The publisher who has amassed a large editorial data base will be in a position to reap the rewards of these new methods of publishing. The American Psychological Association, American Geological Institute and Congressional Information Service, to name just a few, are publishers who are currently undertaking efforts of this nature with the help of service companies. The products that they are "marketing" are primarily in the form of the printed page but they are simultaneously developing a machine readable intellectual data base reflecting their editorial efforts. This service of producing both the printed page and the machine readable data base is being provided at costs less than that of normal typesetting.

b. A service company can provide a full range of services economically where it is impractical for a publisher of an information service, even on a monthly basis, to afford a full data processing department, equipment and staff. It is practical for them to afford this service.

Equipment hardware requirements are large and very difficult to justify. Mr. Ray Lannon's report "Electronic Composition Cost Compairson" indicates that on the basis of just typesetting, it is virtually impossible to justify this hardware. In the service organization there is at least the potential that the equipment will be efficiently utilized and to be economically justifiable.

Data processing personnel are both expensive and difficult to manage. To make problems even worse there are few persons with the combined knowledge of computers, systems, and the publishing industry. To do an effective job of providing this service the group must have this experience.

c. Software is expensive - Software development has to this date proven to be a very unwise investment. I cannot substantiate this generalization but none of the development efforts of which I am familiar have reaped a return on investment equal to what a good savings account would accrue.

The more generalized a software package is, i.e., the larger breadth of problems that it provides solutions to, the more economical a specific implementation of the package should be. To make this equation more direct, the more money spent as investment in software, the less dollars will be required to use the software for each single application.

This large cost of generalized software makes it imperative that the cost be spread over a very large volume of publishing if the cost is not to be prohibitive.

The cost of "Systems Set-Up" (programming which is necessary to do each new job) must be low enough to distribute over that job, or the job should not be automated.

As the well developed generalized software system minimizes systems set-up cost and making a copy of the generalized system is relatively inexpensive, the service company who has developed 'good' generalized software, should be able to distribute it as a profit and to the benefit of the industry.

Assuming that these reasons are valid and our survival is worthwhile we must decide what to do.

What Can This Group Do?

a. We the service companies can help ourselves:
   (1) By being honest with ourselves. We are in this business to make a profit and to provide a service and unless we are able to do both, we

have no right in our free enterprise system to survival. Prices which we charge for systems set-up must include enough money to at least cover our cost. Prices which we charge to provide the service must include at a minimum our cost in providing the service and a figure for amortization of software which would repay that investment. To both of these charges, we must add sufficient profit to earn for our investors a reasonable return on investment. Any pricing which does not include these factors is not an honest price. If we charge lesser prices to get the job we are not only risking our businesses but we are being dishonest with the publisher.

Competition among the many service companies if handled on a more positive basis, would do ourselves and the industry good. We as technicians are conscious of many of the flaws of our competitors, we should stop trying to scare the customer by talking of the other man's flaws and become more positive by discussing our own good points. We usually succeed not in scaring the customer away from our competitors and to ourselves, but in reality scare him away from automation in general.

b. You the publisher can help.
By evaluating the services offered justly. I do not wish to imply that you should buy an automated service which offers less or equal to what you are now buying and cost more! But! You should evaluate total cost of the product when produced with the automated system vs. producing the same product manually. The cost of typesetting alone is not usually a valid comparison even though this method is typically used when evaluating several alternative methods of producing a book. You must at least evaluate each of the following costs:

(1) Typesetting: The total cost of typesetting including your experience of charges for author alterations which are typically extras in the typesetting bid and covered in the updated cycles of the computer system.

(2) Proofing: The cost of this function internally is very difficult to pre-estimate, because it is in fact relative to how good a job the vendor does in either a manual or computer system. You should be aware of the savings that may accrue to you by reducing your internal 'proofing' checking efforts if computer systems are properly applied.

(a) "Once correct, always correct," is a phrase that we use to describe the handling of data in the PI/ONE™ system. This level of quality is being maintained by all of the service companies at this workshop. It is only possible when using equipment that does not make mistakes.

(b) Data keyed, proofed, and corrected once may be replicated to several sections of a publication. This keying once and printing several times not only reduces our cost of keying but also reduces your cost of proofing proportionately.
(c) Constant phrase and punctuation, when inserted constantly by computer program reduces cost of original copy preparation, keying and proofing.

(3) Organization Cost: The first business data processing equipment developed and used in this country was for the explicit purpose of sorting the 1890 census data into meaningfull categories. This function of organizing data into pre-defined sequences for publication is one that offers the biggest "Bang for The Buck" to the publisher today.

Several of the internal functions which you should delegate to the computer are:

(a) Sequencing.
The computer can be used to sort any data stored in machine readable form into any pre-defined sequence you may desire. A thorough understanding of the manual systems (Human Interface) involved in the collection, organization, and dissemination of the data must exist before a decision is made to allow the machine to sort.

Data may be selected or gathered and entered into the computer in a sequence convenient to the original authors or editors of the data. This may even be at random as long as there is a method of cross checking the original manuscript with what is stored in the computer. Audit trails established by the computer to reference back to batches of initial input are the typical schemes used in business applications. These also work very well in publishing applications. Accession and log number schemes which are used to control manual copy flow also work well in automated systems. The only limitation is that there must be some method of copy control, no matter what the system.

Computer prooflists can be printed of all or a portion of the data in any sequence to aid the people producing the publication. These sequences usually include all the sequences that will be found in the final publication and may also contain others for checking purposes only. In a manual system these separate sequences of displaying the data are avoided when possible due to cost.

(b) Indexing and Cross-Referencing. People (your customers) are becoming more and more conscious of the use of their time. The information publication which offers many access routes to the data will save the user's time and increase the value of the publication. Computers can produce these indexing cross-references at a fraction of the manual cost without errors.

(c) Cumulative and Selected Publications. Many good manual systems have evolved for repackaging information for the market place. All of these systems are slow, error prone, and expensive when compared to a good automated system. There exists many opportunities today for the publisher with the ability to define, produce and market information products which are accurate and up-to-date.

In addition to being willing to consider internal cost savings, a publisher must also recognize any improvements or value added to his information product via mechanization.

(4) Value of Time: Time is an important factor in any information publishing effort. It would be virtually impossible to produce the CIS index manually within the time frames that it is currently being produced. This quick release of the information makes the index a current-awareness publication as well as a retrospective search tool. How many additional subscribers does the CIS have and will it have because of this?

(5) Value of Accuracy: Accuracy is another hard factor to evaluate when going to an automated system. If the service company is providing a truly fully automated service, information once captured in machine readable form will remain correct, be organized consistently and displayed properly each time the publication is produced, be it in the original issue or any cumulative or selected issue produced at a later date. The value of this accuracy in reduced proofreading time can of course be measured but the value of knowing that every reference index in the publication is correct is priceless.

(6) The value of a machine readable data base may some day exceed all the other reasons for automation of the original publishing effort but unless this data base is a true information file, maintained without typesetting codes and with explicit information flags, the base may prove to be worthless. Several information publishers today are exploring methods whereby they can capture

in machine readable form information that was manually typeset for them as a primary part of their initial publishing effort. These publishers feel that even today with the high cost of information processing and communication lines, that this data will pay its own way.

The cost to capture data in machine readable form is continually rising (as this is a labor intense function) while the machine cost to store, select, and communicate this data is going down.

c. The association can help - by establishing and maintaining what would in effect be a super Better Business Bureau for the information industry. This group would have all the responsibilities of the Chamber of Commerce, the Good Housekeeping Seal of Approval and the Better Business Bureau along with the crusading self-righteous attitude of the church.

(1) As the "Chamber of Commerce" , it would promote the state-of-the-art in providing automated service to the information publisher. This promotion would be directed to the publisher to show him what new methods are available, in a realistic world today, for him to produce his products and to earn profits on new and innovative information services which he may provide only by utilizing the latest state-of-the-art techniques. This "Chamber" by directing its effort to helping the publisher earn a profit, will be consistent with good business practice and our free enterprise system.

(2) As the keeper of the "Good Housekeeping Seal of Approval", it would establish and maintain standards of ethics and service. It would police those by having continual audit rights with the service companies holding its seal. This would at a minimum include the right to audit the quality of services provided to any publisher by the service company. It might also include the right to audit the basic pricing policies, to ascertain that the firm was not taking advantage of the buyer, if this does not violate some of the antitrust laws which prohibit price comparison. At any time the service company did not meet this high, exacting standard implicit of the seal his seal would be removed.

(3) The Better Business Bureau polices the retail market place by providing a central point for collection and distribution of complaints. In most cities this Bureau is a "weak sister" as it is afraid of offending or harming any firm. There are antitrust laws which make this type of operation very risky, but with the proper council and guide lines I feel that it could become a major force in

improving the quality and quantity services provided to the publisher.

Unlike its weak counterpart, this bureau would collect information on each job being performed by any of its member firms and disperse this information to the publisher on a very discrete, as requested, basis. If the publisher has a proposal from the ABC and XYZ service companies he would be able to contact the bureau and find out how many jobs of this type each company has performed, were they successful, and other pertinent facts about the firm. With this information available to him, the publisher would be able to more easily assess his risk in going with the service company, and the service company knowing that each job will have a major effect on his future will be more conservative and less likely to not perform to the fullest expectations (those he created by good salesmanship) of the publisher.

The total effect of this super Better Business Bureau would be to improve the quality of service provided to the publisher, thereby improving his confidence in the service companies which would result in increasing the level of automation in the industry to the benefit of all.

We may not have the "guts" or ability to implement the full scope of this proposal but we must, if we wish to have the honest service companies provide their service to the publisher, establish some method of identifying the Scarleton's among us who are promising to solve all the publisher's problems with the computer.

Computer Composition Problem from an Educational Institution's Viewpoint

Herbert E. Phillips

From the vantage point of an educational institution, Rochester Institute of Technology seeks ways to properly and effectively assist the Graphic Arts industry in areas of education, research, and the dissemination of education.

The Graphic Arts industry seems to be in a dilemma. The changes in typesetting have been rapid and frequently influenced or brought about by companies heretofore outside of the printing industry. The changes are thrust upon us so fast it is difficult to efficiently accept them, plan for their acceptance, or properly utilize them once installed.

Although the net results of a well established, efficiently working computerized typesetting system seem desirable to the user and others concerned, the route to this goal is full of pitfalls, the risks great, and failure can mean financial disaster.

The present state of the industry could be summarized as follows:

(1) The recent past has brought many new sophisticated developments including equipment, methods, and the potential of complete systems. (And, the demand for new personnel talents.)

(2) The present and near future would seem to include:
   a) the updating or revision of these developments with comparatively little additional new developments.
   b) the tremendous task of learning what to do with what is now available.
   c) the task of training management and operating personnel at various levels to integrate the new into tomorrow's business operation.

Industry Education Facilities and Programs

Composition equipment, computer center facilities (listed below) and related equipment have been placed at RIT in the School of Printing and Graphic Arts Research Center for use in the various education and research programs. These programs include the Composition Systems Seminars and a variety of special tailor-made research and education programs arranged to fit the needs of individual companies or other common interest groups.

The availability of sophisticated equipment at the institute and the flexibility to create seminars to meet industry needs have resulted in short-term seminar programs for middle and upper management, new sales staff, supervisory user groups, and others.

Research, Development and Testing

Accompanying the development of equipment must be the proper supplies to be used. The RIT research center staff assists those interested in new material development and evaluation so as to help insure the user of a compatible combination of materials, methods and equipment.

Publications and Information about RIT Services

Graphic Arts Progress - A review of current information in the field of graphic communications. The Graphic Arts Index, a list of selected titles from current publications, is printed in Progress.

Graphic Arts Patent Abstracts - A monthly publication listing selected patent abstracts from the patent abstract section of the Official Gazette of the U.S.Patent Office.

Industry Seminar Brochures.

Partial List of Composition Equipment at RIT for Education and Research Programs

Direct Impression

Varityper 1010; Justowriter system; IBM MT/SC

Phototypesetting

Fotosetter; Linofilm Super Quick; Photon 713-10; Compugraphic 2961; Friden Justotext 70

Keyboard Input

Teletype Perforators; Star Parts Compuperf; Friden Perforators (a variety of models); Photon KeyComp 5, (due in the near future)

Computers and Peripherals

Linasec (special purpose computer used only for type-setting/semi-automatic); IBM Model 360-40 128 K memory; (5) 2314 Disc Packs; 40 Million byte memory storage; (2) 2400 Mod 2 magnetic tape drives; 2780 Remote terminal; Chain Printer; 1100 lines per minute with upper and lower case chain; 2495 Cartridge reader; Plotter; IBM 1500 Research Computer used with 8 Video Terminals

Computer Photocomposition Problem Areas

1. One of the problems that I've run into with computerized composition is the unwillingness of the compositors I've worked with to share the benefits of the technique. One of the principal reasons for using computerized typesetting is the advantages from permuting the material, resetting parts of it without the necessity of rekeyboarding. Yet, when I have attempted to do this, I've been charged for the reset material almost as though it had had to be rekeyboarded. Obviously, if I'm making no cost saving there is little incentive to try a new typesetting technique.

2. The compositors that I have worked with have been most reluctant to permit users to keyboard material, perhaps for fear of input quality (often justified) or for the desire of using their own keyboards. Compositors' refusal to accept our own computer-compatible keyboarding has forced us to lose many of the advantages of computerized composition; we now have to keyboard as though we were sending material to a hot-type shop and the shop in turn has to keyboard again into computer-compatible format.

3. Informational needs vary; individual manufacturers seek solutions to some, but not all. At best, we are groping -- if not in the dark, certainly in the shadows. There is no clear definition of needs...benchmarks against which private industry can develop innovative solutions. Each manufacturer focuses on a specific area; there is overlap and duplication of effort; there is a lack of commitment on the part of many firms and, certainly, there is little cooperation and encouragement from either side of the fence. The cliche of the information explosion is based on hard fact. At every level of society we are faced with informational bottlenecks. Computerized composition is one answer--but it must evolve from the joint relationship between those concerned with information science and those in the private sector that can implement solutions. At present, there is confusion and several half-hearted attempts at an answer. We must stop throwing the bull and aggressively take it by the horns. We need direction and cooperative determination.

4. Technological development now progresses geometrically. Where it took 400 years to go from man to machine and fifty to go from mechanical to electronic techniques, present developments are literally obsoleted upon introduction. Computerized composition is one example of a technology that ran away with itself...and grew out of proportion to the market it hoped to tap. Vast typesetting power on the output end developed before input and computer processing methodology could keep pace. A broad, rather than specific, approach to the market compounded the dilemma. Computerized composition now faces a crisis: what needs does it intend to satisfy and what customer-

oriented methods will it use.

5. The graphic arts industry is made up of many different market segments...including the newspaper, publishing and commercial areas. The needs of each group vary, both between groups and within them. Today's equipment, primarily typesetting and other pre-press functions, must incorporate the flexibility to meet individual needs on an individual basis. Phototypesetters designed for the newspaper market may not perform the commercial chore required. Speed is not the primary consideration in many instances. The phototypesetter must be job oriented as must the entire pre-press system. This is the challenge that faces manufacturers serving the graphic arts industry. We must be more customer oriented in our approach to machine design and function...otherwise, for whom and for what reason are we building equipment?

6. One of the major areas for improvement is in faster, more flexible ways to input text material--including original keyboarding, correcting, fitting and authors' alterations. Magazines especially have problems with fitting and late corrections. Our idea is that all writing and fitting should be done in a very easy-to-change medium. We've experimented with CRT terminals.

7. What hope for a fast, inexpensive letterpress plate made from photocomposed copy--such as VideoComp? Many publications will stick with letterpress because it's flexible for edition changes and long runs.

8. In the future, will original keyboarding of text occur much closer to the publisher, or will the printer continue to handle most of it? Will composition be increasingly separated from the printing press as we go to more satellite printing plants and possibly fewer composition centers?

9. The difficulty of objective evaluation of new typesetting systems and equipment, especially when plausible assumptions are substituted for actual test data.

10. The problem of coordinating the two fast moving information handling technologies of data processing and typesetting.

11. The tendency to ignore the deterioration of typography. The errors and inadequacies of computer assisted typography are excused as being no worse than those produced by careless human operators. The latter, in turn, explain their sloppy typesetting with the excuse that a poorly programmed computer will be blamed anyway.

12. Problem definition and specification writing prior to the bidding or acceptance of an application seems to us to be a major shortcoming of most customers. Is there an area here for Industry Standardization? If so, what

organization is the logical vehicle? What should be the result of such activity.

13. Members of the Business Data Processing Community per se (in our experience) are uninterested in and, in many cases, unwilling to exchange information and data where an obvious paralleling is taking place. The opportunity for mutual and multiple use of any given data base is being wasted most of the time. How can we get this message across, effectively, to the Business Data Processing Community? Do we in the Computer Photocomposition area have shortcomings that need correcting?

14. There is a definite need for Trade Customs. Such questions as the following need to be faced: who owns programs; what liability, if any, does the photocomposition house have for wrong information getting into print; should some proofing be mandatory?

15. Input subsystems are needed to achieve a price-performance that is acceptable. These systems will include hardware, software, languages to permit input of formulae, structure diagrams, foreign alphabets.

16. Conventions or standards must be established for the identification at source of structural elements of text to be carried through the entire text processing operation. These should become the basis for programmed typographic specifications and the identification of retrievable data elements.

17. Standards for the representation of characters beyond the character sets used in business data processing are needed.

18. The economics of small run-on-demand publishing should be explored.

19. What are the economics of a "total" text handling system to include input, proofing, editing, composition?

20. Micropublishing has been defined as the production and distribution of published information in a microfilm form. The industry has primarily been producing microfilm copies of standard published works. Gradually, there has been a percentage increase of micro-published documents directly created from computer generated information. The expanded number of COM(Computer Output Microfilm) devices and number of photocomposition programs will make this an important publication medium.

21. Many books and other documents are deteriorating and the information contained in them will be lost. Microfilming will save the existing information. A preferred solution to this problem would be reading the

documentation and then republishing. Automatic reading such as OCR with computer reformatting can make this possible.

22. Developments in the COM (Computer Output Microfilm) area have created sufficiently high quality output for printing consideration. Nearly any font can be structured for microfilm. Enlargement to offset plates can make possible reduced cost printing methods.

23. Students and other end users of printed documentations need increased amounts of specialized information which can best be provided by extracting from various pieces of literature and recombining. This extraction and combination can best be effected by utilization of computers and computer controlled photocomposition.

24. Hardware: first, any discussion of computer controlled photocomposition must be split into two areas. Those phototypesetters with a computer built-in and, secondly, those utilizing a general purpose computer off-line. There is no doubt that off-line use is the most glamorous; however, phototypesetters with built-in computers have the largest number of installations and greatest potential markets. With the cost of computers continually coming down, the trend to built-in computers should continue.

25. Software & Systems, Economics & Costs, and User Needs: these last three areas cannot be considered separately. The hardware in any system is easiest to identify, understand its capabilities and determine its price. The major problem in computer phototypesetting today is to understand the users' needs and then convert them into software and systems which are economically feasible for the user. Where the problem develops is that there is failure on the part of the user, manufacturer and/or both to communicate needs, capabilities and costs to each other.

26. Multilevel Composition: a major problem we have encountered is the composition of mathematical material. Even the setting of chemical structures seems less of a problem than the setting of math. We are setting math using the computer but we consider our methods ponderous. We feel sure that better methods can be worked out if we can find the time and money to apply to the problem.

27. Proofreading: another area which is a serious bottleneck to further development. We need some adequate method of proofreading which can take place before the material is photocomposed in order to reduce the necessity of repeated runs through the photocomposer and of excessive stripping time. At the present time, the need for second and third runs or more through the computer and the photocomposer are hurting chances

of achieving economic justification.

28. Keyboard Evaluation: Much of the cost of the computer controlled photocomposition operation is in the keyboarding area. There is a current need to get some useful evaluation of the various keyboarding devices on the market. There is equal need to develop approaches to keyboarding which will simplify the handling of large numbers of characters even though bound by the limits of the standard keyboard typewriter.

29. Software is the critical problem which must be overcome if computerized typesetting is ever to have a major impact on our obviously antiquated means of disseminating information. This is not a unique or original observation. In fact, I have found no one in the industry who would disagree with the statement made in the Battelle research papers distributed at COMPRINT 90: "The primary bottleneck in the implementation of the computer for an ever-increasing variety of applications is and will continue to be the lack of adequate programming." The Battelle report, completed in 1968, assumed that, somehow, these programming bottlenecks would be overcome. We know now, two years later, that this has not proved to be the case. There are only a few computer typesetting programs available for general use and these have all proved to be at once too cumbersome to use, too limited, and terribly uneconomic for most applications (see Ray Lannon's report on the economics of computerized CRT typesetting.)

30. Moreover, having now discovered that typesetting is an inordinately complex field involving an incredible number of esthetic as well as logical considerations, no one seems willing to invest the talent and the financial resources required in any major new program development project, unless they have a large and quite specialized operation which must be automated at virtually any cost (such as a large metropolitan newspaper); or unless they can reasonably expect to sell tens, or even hundreds, of millions of dollars worth of specialized equipment as a consequence of having developed these programs. In the first case, the programs which might be developed will be special-purpose rather than general-purpose in nature and, in any event, will be guarded closely by those who paid for them. In the second case, the programs must be constructed to operate only with the intended hardware devices or else their value as a sales tool is lost.

31. The development of new, easier-to-use and more economic, but also more powerful, software is crucial to the progress of computer typesetting, and, indeed, a whole spectrum of computer information processing. The software which now exists is not adequate to the task, and, more critically, the new development required is just not getting done. The investment is too great

for any but the largest firms to support and even they have no economic incentive to develop programs of general application.

32. We need now to build on the experience which has grown out of developing and using current systems and to implement new insights as to the nature of the problems and new ideas as to possible solutions. There currently exists no organizational framework that I can see in which this is being done or even within which this could be done. Quite simply, we are stalled.

33. How can the interface between printers and publishers be improved? By this I mean that only too frequently printers discard the input tape, for instance, which is used to typeset a book, while this could be used for information retrieval and automatic indexing if the software were available. Printers also are frequently not able to help in areas such as distribution, by setting type in one location and printing the book in several locations. As an aid to the printer, more publishers could take greater pains to make certain that authors' alterations are in fact reasonable and necessary. Is the only solution to this problem the entry of publishers into the typesetting field?

34. Will the facsimile newspaper, magazine and book eliminate computer typesetting, or will they only eliminate printing? What I mean is, long after a certain degree of video and facsimile systems have become accepted for a wide range of purposes, will computer typesetting still exist as a separate entity completely divorced from any aspect of printing? I personally believe that it will and am also convinced that the printed page will also never totally disappear.

35. Before the advent of machine typesetting, there were wide varieties of type styles and faces available. When machine typesetting became common, the type matrix design and manufacturing operations were controlled by the manufacturers of the machines, so the availability of unconventional or infrequently used typefaces tended to diminish. With the new multiplicity of typesetter manufacturers, will a greater range of type styles once again become available, or will necessity for back-up tend to limit the type styles to those which are available on machines of all manufacturers, thus further limiting the total range of styles?

Panel 1
User Needs

SHATZKIN

I would like to make a few remarks before we start the panel discussion concerning the differences between the approach taken in my paper and that provided by Mr. Tunnicliffe. His point of view is from the mountain top; mine wasn't even from the low hill top. It is from the bottom of the mole hill. The view from the bottom of the mole hill is a great deal different. I define user item the way he did but from the viewpoint of a consumer of computer composition (in my case as a publisher) and the view is very parochial. Speaking as a publisher and user of computer composition rather than as one who supplies publishers, I tried very hard to make the subject complicated enough to justify the attention of such an august group as this and I couldn't because it is really very simple from the viewpoint of a publisher.

From such a viewpoint, the need for a universal system is certainly questionable. I would say that the slowness of the penetration of the book publishing market by computer composition is due to two things. In the first place, the communication has been with the wrong people. The compositor has been selling to the book designer rather than to the book publisher and the "needs" of the designer may be quite different from the needs of the publisher. A second area is the search for the universal typographic solution which will satisfy all typographic problems. It seems to me that computer composition would have invaded the book field earlier and would have supplied something very useful if the approach had been confined to the most likely typographic needs. After all, seventy five per cent of the books that are published are in two sizes: 5 1/2 x 8 1/4 and 6 1/8 x 9 1/4.

Aiming for these two book sizes reduces the degree of flexibility required by the publisher in the way of typographic output. Within this 75% of the books there are a series of fairly simple typographic problems that need to be solved. If the suppliers of computer composition had proposed arbitrary solutions and provided programs for handling each problem in a limited number of ways instead of an unlimited number of ways, programming cost per title would have been minimal. You would have found a large number of books which might have been handled by computer composition at costs which were not prohibitive as they are now.

Mr. Tunnicliffe's presentation makes a lot of sense if one assumes the only way available to us to set books is by computer composition. However, there are other means available and the problem is not how to get books set by computer but how to decide which books are logically

eligible for the computer in the first place even if the others must be set just the way they have been set for generations. Those books which qualify now by reason of economy or speed should invite the use of the computer because it is economical and fast. For example, I probably exaggerated in my paper by saying that we don't need hyphenation and justification and that they should be eliminated now. Maybe it is pressing too hard to suggest that we do away with them now because they are a positive evil. That is an extreme view. But the other extreme is equally bad. I question whether we should offer the publisher the possibility of setting the book and then looking at it to see if that is the typeface he wants. I think the way to handle the problem of the publisher who has chosen the typeface and then finds that that is not what he wants is not to provide a computer program that enables him to have an infinite choice, but to let him fire that designer and pick a designer who knows what Times Roman looks like in the first place and doesn't have to have it typeset to find out what it looks like. And this is the sort of thing which the designer will not tell you but the publisher will understand when you point it out. In other words, I think that we have suffered by not analyzing the needs of the publisher because we have been too busy analyzing the needs of the designer.

PHILLIPS

I am in the graphic arts research center of the Rochester Institute of Technology (RIT). I would like to make some brief comments concerning the material provided for the proceedings.

RIT, as you probably know, does grant degrees and offers university level programs in the areas of chemistry and engineering and in the two schools of printing and photographic arts and sciences. In addition to these schools, RIT operates the Graphic Arts Research Center. We face the dilemma of trying to assist you and your industry in the kinds of problems of concern to this workshop. Should a university or institute like RIT operate additional degree granting programs? This is one of the major problems and we invite your critique of our programs and your suggestions as we look in our crystal ball hoping to put together the right kind of programs to satisfy the industry's future needs.

As a research center and in the situation also of running an industry center, we look at short term situations also. So we have available a composition systems seminar as well as tailor made programs for small groups from individual companies or groups with some common interest. In the material submitted for the proceedings I described our view of the present situation of the industry. I think we are faced with a huge amount of new information and new equipment coming from industries heretofore not a part of the printing industry. The IBMs, the RCAs and the others with electronic expertise, chemical expertise and

others are being brought very rapidly into contact with the printing industry which is having difficulties in accepting the new technologies in an organized manner. So the question is what to do with these kinds of problems. We at RIT are pleased to join with you in this kind of dialogue to bring out the problems and then search for solutions to them.

PARKS

I am with the Technical Development Group of Time Incorporated. Our responsibility is to do the company's research development and engineering work. We've been in this area of computers, typesetting, photocomposition since 1950. I have been doing this work for the last eight years. I must say that it has been a fascinating eight years although there are times when I am not terribly certain that I know what I have learned. I know that I have been more vocal and more positive about things in previous meetings and have worked with the certainty of knowledge and a zeal for what we are doing. I think, in part, my uncertainty has to do with the nature of the times and the nature of the company's current outlook on these things. At this time we process all of our publications through what I think is one of the more sophisticated systems in the world. We have a pair of IBM 360/40s entirely devoted to computerized typesetting. This system was built for the company's needs and through it pass every word that is published in Time, Life, Sports Illustrated, Fortune and myriad books. The nature of the times has a great deal to do with our outlook. When I first started into this activity, we were in good times. Today, we are more concerned about the dollar and the economy, costs, etc.; whereas in those days, the question was "Where was one of the world's major publishers going to go in the light of revolutions that were taking place?" Let's face it. No matter how you look at it, to get in the game you have to put in an ante. You have to commit yourself. You can't just look forever and listen forever and read papers. And we did put in that ante with productive results. Now the game has been changed and quite obviously many of the ground rules with which we started have gone by the board. I personally think they will come back. I assume that the economy always rebounds. If it doesn't, this discussion is academic anyway. So that some day, we will be back in the 'gung ho' spirit and building on what we had before.

I will say that it has been hard in one regard. Recently, we even considered the possibility of going back to our old method of doing things. But really, there are no basic base lines to which you can return. Progress is not reversible. When the teletypesetter was introduced by Time Incorporated some thirty years ago, I presume it was just as radical an idea as computers to replace our teletypesetter operation is now. And yet, many people yearned to go back to the good old days when the first few years' cost of using the computer were observed. Tele-

typesetting was the norm. It was the Gutenberg of our company. The situation was considered at the highest levels of the company with a tremendous number of manhours spent in evaluating the situation. Should we continue or should we go back? And the answer finally came out to continue. I think that the largest contributing factor to that decision was not the production oriented people, although they were quite concerned as to whether there is such a thing as going back. I think the thing that turned the trick was the attitude of the creative people - the editors, the people who had to interface with and live in both the editorial and production worlds. They simply felt that today the computer was so much a part of our way of putting out a publication that they couldn't go back or they didn't want to. So the decision has been to continue. Now, I would love to say something profound here that would be of value from what we learned. All I can say is we did go a particular path which at every instance seemed to be the right one at the moment and that is how you get from there to here. The system we built was built in a very selfish way, which is not the approach to systems building that most companies can afford or care for as a rule. We simply took the company's requirements and designed a system to match those requirements, which is a lot easier than being the supplier who would like to strike a hot market the first time around and who builds everything into this system so his salesmen can sell anybody whose door opens to them.

There are some large pitfalls in the area of generalized language. While it is good to have a universal concept in which everything will fit, I think it tends to a certain extent to be self-defeating in the sense that there are so many people that have to deal with this situation and very few people are good at mastering such complex situations. When you want them to learn the whole language when they are only interested in part of it and when they have to fit in their requirement as a subset in the total situation, you're putting a tremendous strain on them. People simply don't do these things very well.

One of the things that I have learned from the experience that we've had is that the greatest unknown in the whole thing is people. The technical part, dedicated people can do and do in many different ways and I suspect that most of those ways are valid. It isn't a case of selecting one or the other. The real problem is the organizational lines that you have to cross, the old habits that you have to break, and the anxieties. Let's face it; in the end everything is being sold on an economic basis and that means the money's got to come from somewhere. Everyone says - is it going to be my salary, my wage, from which this economic benefit to the company is going to come? You can just hear it and read it in every nuance of everyone of the many people who may in some way be affected by these systems. It is against this situation that the user

has got to contend, whether he is bringing in outside expertise or has his own.

I suspect that many cases where the economics have been added up as an 'after the facts' consideration, that a lot of it has resulted because of a somewhat pure concept, which in itself may have been unreasonable in its estimate of how many people it takes to do a job. When you turn and look at the system afterwards, you find a disappointing performance. We have heard this described already in this workshop and I suspect the real reason is because people are good at preserving the status quo. After all, that is survival. I don't know that there is any answer to this except to say that, in an evolutionary sense, the future will come about despite this kind of resistance, but not as a revolution. I really don't think it will except in those rare instances where you have a very monolithic structure with perhaps one single voice which says how things shall be.

SCHARPF

I am the Executive Director of the Graphic Communications Computer Association. We seem to have a difference of opinion on the matter of flexibility versus limited scope of the programming approach to composition. Mr. Tunnicliffe has described an approach involving flexibility in formating of input and flexibility in output capabilities; Mr. Shatzkin, on the other hand, has asked why haven't we progressed faster in computerized composition by suggesting that we are trying to be too flexible. His position is that we need a more limited scope which will allow more economical production.

The purpose of this meeting, as I originally understood it, was to consider the fact that a great deal of information is being generated and processed by professional societies, and other groups in the field of scientific information. There is a great deal of material being developed through typesetting, text editing routines, etc. Why can't we get this type of information disseminated more readily through computerized composition? I think a major consideration as to why we cannot get such disseminated more readily has been described by Mr. Tunnicliffe. We need a greater degree of formating of the material as we originally create it.

I participate in the ANSI, American National Standards Institute, Committee X3 on Computers and Information Processing, X3 has a steering committee called SPARC. SPARC has a number of ad hoc committees. One of these ad hoc committees is called SPARC/TEXT. It originally started out being called X3.2.G. The purpose of this committee is to build a framework for creating standardization of extended character sets. This might be described as extending the

scope of ASCII to include something like 15,000 characters. Now the chairman of this committee is Dr. Blanton Duncan, a chemist from the National Bureau of Standards. His interest in this field of coding for extending character sets is simply that he wants to be able to take material which other people have created and put it into a printed form, whether it be microfiche or paper. He cannot do that today for several reasons. One is because he doesn't know what codes have been created in the first place as used for all the characters. Secondly, if the material has been typeset, it is imbedded with all kinds of typographic commands which have no bearing perhaps on what he wants to do at this point. What he wants to do is to be able to put in his own typography, based upon the intellectual structure which should be included in that tape. This is what Mr.Tunnicliffe said in his presentation: the code of the material should include the content material plus the editorial instructions which when combined make up the intellectual structure of that data bank. The typography codes should be able to be added later if it is decided to typeset the material. The work of the ANSI SPARC/TEXT Committee is taking into account only the standardization of the characters themselves and the editorial instructions and is thus limiting itself to the intellectual content of the data base, not going into the typographic perameters.

The reason for Mr. Tunnicliffe's presentation and the reason for NSF's asking for this workshop was to explore how we can get the scientific data bases that are being created disseminated more readily through computerized composition. Why can we not do it today? One major reason why we cannot do it today is because the programming systems available are not geared to take a data base which has been created for general purposes and convert it directly into typographic situations.

DUNCAN

It strikes me that in considering the user in this session that no one has mentioned the author. It occurs to me that the author may be the most important user. Mr. Phillips made the remark that publishing is the business of applying mass production methods to unique products every time. My concern is with the author. Until last week I wouldn't have been able to make the point that I am making now. There is a little thing out on the horizon that may be a ray of light and it may be a cloud. If I had to write a paper, and I wanted to publish it, I am presently free to choose several means. I was trained to go through an editorial review process. One of the questions that every reader has to answer is: was the medium that was chosen by the author appropriate for publication. The subtlety here is that there now exists something called NBS magnetic tape No. 1. It so happens that the authors of that publication chose to publish on magnetic tape. They chose not to print it. Now I am not saying that you can't print that thing; in fact, they give you instructions on how to print it. But because they knew that the audience that they were addres-

sing both included human eye balls and compilers of computer programs, they preferred to produce it in magnetic tape form. You can dump it and read it, until it looks like garbage to you but it looks like cherries to a computer. There was a reason for choosing magnetic tape. If we are going to standardize something, we are not going to standardize a process; we are going to standardize a product. You can't standardize a process unless you have a manager sitting and watching every step of the process. On the other hand, we can standardize the product. And if SPARC/TEXT comes up with anything, it's probably going to standardize what can be on a piece of magnetic tape.

SCHARPF

I think that what you are saying is just the point. When we do create a data base, we need to create it with a full intellectual structure to which the typographic requirements can be applied later.

FAULKNER

I am President of Graphic Arts Data Service, Chicago. My company has to contend with the end product of all those things we are talking about today and that is make something graphic from it. We have on the premises an RCA Spectra 70 computer and VideoComp systems, which we have operated for roughly a year and a half and prior to that have been through the elementary school of the second generation of photo composition equipment and computer systems. My statement and question in response to the chairman's request are rather mundane by comparison to some of the realms that you gentlemen have been talking about. (Editor's note: see the compiled list of problem areas prepared by the participants before the workshop). There are things which should not be overlooked when it comes to implementation: such as trade customs and programming propriety. These are of necessity a very real consideration to those of us who are producing this material in one of its final forms. In response to Mr. Shatzkin and Mr. Tunnicliffe, it seems to me in the light of our experience that we need to have both of these systems that each of these gentlemen described. If we are ever going to be able to look into a data base and extract useful information from it in a form that is readily comprehensible, has a great deal of utility and is easy to manipulate, we need the generalized system. The standards that Mr. Scharpf spoke of will allow this to come about so that all producers all over the world will know what the equivalent of a given character might be, however the character set is designed. And then the particular application that Mr. Shatzkin described as a need, which it certainly is, only one of many, becomes a subset of this.

Now, over the last few years, there has been many millions of dollars spent trying to achieve both of these goals, but independently. If you are reasonable well informed about our segment of the industry and the information industry as a whole you know that there have been many people

who have started in this ball game who have not made the grade. One of the reasons for this is the state of flux that exists at the level of the publisher. We visualize the 'user' first in the context of our own activity; when I first thought 'user', I thought, that is where I belong. I am the user, I use the equipment. We use the software that is presently existing or that we have written.

The writer, the author, is a user from a different level, from a different approach and in a sense, we producers really ought to stand back and say O.K. fellows, make up your mind what you want. And then let's talk about implementing it. On the other hand, that is dangerous because I think we have something to contribute. We have been down this path. We are continuing to go down the path, hopefully making fewer mistakes each passing day. But we've made some beauties and I take my share of the blame. Largely errors of omission, underestimation. We make some errors in commission as well but so many times, we are trying to implement the desire or requirement by people such as yourselves. The problem really hasn't been properly defined. And that starts with you.

When I speak with customers, potential customers as each one of you may be, the most important thing I think I have to get across is that you must be involved in whatever is going to come out of this system at the end. I can think of three instances within the last few months, where there were major conversions to be made in major applications, the publisher did not want to be involved. In two cases, I bowed out saying you cannot not be involved. The third case, I didn't get the job. In two of the three cases which have now come into being, both publishers are in trouble because they were not involved. In view of the fact you are involved at this point and at this level I think it is marvelous and I could go on all day answering comments and speaking to the various points. I would just like to make one other comment to Mr. Shatzkin's paper. I haven't found anyone in the publishing industry that has been able to strip away all the peripheral issues so nicely as he has and if they can only give us something that we can hang our hat on, we'll go ahead and use it. I haven't found anybody that is willing to do that. The statement is refreshing and I hope it is a sign of the times. But it will buy us some time. We must remain profitable or we must get to a profitable situation. If you want to use the services of an organization like ours, we have to be able to have a return on our investment. And to date that has not been possible by any one that I know of in the producer end of this business. Now, maybe someone has to help us to take some intermediary step. It may be that we have to go the 'dedicated' route to keep us alive. For if we really have anything to offer to you, we can only offer it if we are still here. So that is something which I believe is worthy of consideration.

FURTH

I am from IBM. We are involved both in production and also as a user. My particular interest is in the creation of data banks whether the material is typeset or produced on microfilm or any other form. The only thing I would like to add to what has been said before is that, in addition to the intellectual decision point which should be incorporated into the input, from the point of view of conveying meaning, consideration should also be given at this point to how this material can be stored, retrieved by the individual user, the scientist, the engineer. The cost of input to information storage and retrieval systems is entirely too high. Primarily because of the input problems, it is easy to agree with what was presented by Mr. Tunnicliffe and Mr. Shatzkin. Perhaps the material for publishing purposes should include information not only to properly present the material in printed form but also to make it possible to use the input in an automatic abstracting, indexing and retrieval system.

HOWARD TOMPKINS

I would like to ask a question of Leonard Shatzkin and Fred Faulkner. Implicit in their remarks is the judgment that a special system is going to be easier to use and less expensive than a general system. Approval of a general system such as Mr. Tunnicliffe proposed really should be with one caveat: when it is described to a user for his potential use, it should underwhelm him - not overwhelm him. It should be usable by him on his terms. We have in the main stream of computer programming a number of examples of languages of so-called higher level which are very difficult to learn in their entirety. It seems to me that any higher level language that is a part of the scheme that Mr. Tunnicliffe proposes must be good enough to have a subset that meets Mr. Shatzkin's requirement for simple use. I am entirely in favor of a system such as Mr. Tunnicliffe proposes, provided it is well described and communicable to a user, perhaps not in its entirety, but in the form that the user can easily use. I want to ask Mr. Shatzkin: Is it necessary that such a general system, well defined and well segmented, is going to be less usable than a special system?

SHATZKIN

Two ideas have been brought out here. One is the question of inputting to a tape or writing, composing the ideas on a tape, and the other is outputting typographically. There is no question that when you are writing on a tape, it is important to have all the flexibilities that you use when you write on paper. Being able to underline, put a star around something, draw circles around it is important. The idea is not complete if you can't include the kind of emphasis and interrelations which Mr. Tunnicliffe described. The other question is one of outputting. They should definitely be considered separately.

The book publishing industry has been waiting for this complete general system for a long time. It isn't here. I am suggesting that instead of waiting for the perfect typographic system, there should be developed a limited system or system for limited classifications of books. One such system might specify, for example, that all books will be set 26 picas wide, 10 or 12 Times Roman, all heads will be in Helvetica, 14 point, all type pages will consist of 40 lines, each of the following problems will be handled in this way, all footnotes will be set this way, all things which Mr. Tunnicliffe has emphasized as being of primary importance will be set this way, all things that he has emphasized in his composition on the tape of secondary importance will be set this way, etc.

You have two things: (a) I think you would have had such a system available to us long ago; and (b) we would be able to put through book after book through such a typographic outputting system without intervening little bits and pieces of programming and tying things together. This may seem to involve small costs but these costs, $100 here, $200 there, are now disqualifying computer composition as against hot metal composition on a cost comparison in the market place.

The economic justification will remain with us even as economic conditions improve. We are not forced to use computer composition, but in some quarters there is an unspoken kind of assumption that we are going to have to do everything by computer composition regardless of economic considerations. We have a lot of choice. And because we have such a choice, we will use the least expensive method unless we need speed and are willing to pay for it. I don't think the problem is very much different from the introduction of web presses in book manufacturing. When web presses came in,there was programming (in this case called makeready) involved for each job and that meant that the threshhold breakeven point for going on to a press might have been 60,000 copies. That made a certain number of books eligible for web press work. Web press owners are now beginning to realize that this is a difficult way to make a living because the number of such books is declining. So they are finding ways of standardizing book specifications using the same paper, making them the same size, scheduling them so that there are restrictions on when they are delivered. These arrangements make it possible to bring the web press work cost threshhold to 2000 copies from 40 or 50 thousand copies. I submit that the same approach to computer composition could bring the threshhold of computer composition from a directory or encyclopedia or a book of 1000 pages down to something which is just a 128 page book which follows another 128 page book which uses the same program and has the same typographic output.

TOMPKINS

Do I understand your answer to be "yes"? That is, you believe a special system is necessarily easier and better to use.

SHATZKIN
Yes, I believe we will get it sooner; I think that a special outputting system will be cheaper in operation.

PARKS
I wonder if one of our problems is the confusion of terms between special and general. It seems to me that you have a whole spectrum between the meaning of the two words. For example, let me go back to the one situation that I am most familiar with. In a way I represented it to you as being special. Yes, special to the publication of three magazines with a very wide range of formats with completely different ways of editing the magazine. Time magazine is a format magazine with few exceptions. Every line lies on a specified location in the page. There are 76 lines, 3 columns, and most every element can be referenced to this grid, the invisible grid that underlies the page. The Life project pages (the pages that take a subject and explore it, page after page) are spreads that are individually designed. The text for either publication goes through the same machine, so you could argue from one position that this is a general purpose program. The books also go through the same system and the books have one design after another.

But now let's turn this around. Would you care to use our programs, Mr. Kuney, to set American Chemical Society matter? Then we're specialists to you but to our publications and probably to most of the magazines published in this world we are generalists. I think that we are going to wind up with many general programs each of which is special to a given field. If you're going to talk about scientific information publication, then it makes sense to use the right word with respect to that field.

FAULKNER
I would just like to make some comments in direct response to your question concerning the cost of a specialized program. First, I think there exists today generalized typesetting programs that will do substantially the things that Mr. Tunnicliffe has described in System X. I speak of the RCA languages and also the system the Harris Intertype people are using. They are similar in approach and, in fact, one might be astounded what can really be produced with these languages as they presently exist. The more complex the task, the come complex the coding or programming that is required. I submit that the tasks described by Mr. Shatzkin can presently be implemented through systems that exist, perhaps in a cumbersome way, but they can be done. Coming to the cost factor, in our experience where you buy cost effectiveness would be through generating efficient specific programs, and not going the long way around to operate through a generalized program but rather to write the specific requirement; put it in assembly language and go right to the machine. Thus you strip away the complex program interrelationships which

become a major factor in any volume production activity. What Mr. Tunnicliffe is shooting for, as I understand it, is an even broader system base with the ability to accomplish things that are not possible now.

Now in terms of 'underwhelming', I'm not sure that characteristic can ever be an accomplishment of the book systems such as the PAGE 1 language of RCA. That language contains typical instructions; they're mnemonic in nature and they seem to be easily manageable. Page make-up can be done within the framework of the PAGE 1 book system. This is a very complex operation, but it can be done. There is an alternate approach and that would be to write the path that the dedicated program must do to accomplish a specific job. This would provide fantastic throughput when you're only setting 500 or 1000 pages, but it may take you six months to get the program written. We're now talking about whether we can save an hour or two hours or a day. What is the difference? My feeling is that we need this generalized approach, generalized programs from which we can expect to create subsets for a particular application. Until such time as the volume of composition (and I am thinking selfishly of only the type set page, which is our product) overwhelms those producers that are presently in the field, I don't see the necessity of specialized programs.

The key to efficient publishing is on the input side, in my opinion. We're talking about figures that range between $1-10 a page. Now it may cost $100,000 to get down to the $2.00 per page figure. I believe that the greatest advance is going to be made in the very near future on the front end of the system, editorially. The CRT keyboard, which is a display keyboard, provides the in-house ability to build, correct and update a file and only give it to the producer at the time when you are satisfied with its contents. You may or may not include typographic instructions. This is something that will be among the most important advancements for the immediate future.

ENGLE

We do use a generalized system on much of our work and we also use specialized programs on some of our work at R.R.Donnelley & Sons. I am the Director of our Electronic Graphics Division, which is the division which does the high speed composition electronic graphics. The term was chosen to imply that we intend to be in the field with much more than just composition. We were talking here earlier today of other ways to disseminate information other than printing and binding. It is perhaps heresy for anybody from Donnelley's to make this statement, but we do recognize, as we said here today, that in the future there will be other means of disseminating certain kinds of information.

From the viewpoint of our division, I would hope to be in the position to provide those new kinds of services. But at the moment,as Fred Faulkner has commented, I think one of the things that we as suppliers of these sort of products

are faced with is how to economically get through this gap between the situation we are faced with today and when publishers get to the point of offering more services in the manner that Leonard Shatzkin described. We do not find publishers, generally speaking, anywhere near in that framework today. I would hope that what Mr. Shatzkin said is an indication of what might take place in the publishing field. I suspect it will. But I also suspect it will be quite a number of years from now before we really get to that point. I think there are many of us in the business who are trying to supply products in this field that are going to be faced with a real struggle in the interim period. Let's speak about a specialized program.

We do the Dunn & Bradstreet reference books every two months with about 7000 pages being set each time. We have written a specialized program for doing that job. Using a generalized program on that high a volume would not have been practical although it could be done.

We have another generalized system which we have chosen to call the DCS, the Donnelley Composition System. It operates somewhat differently than PAGE 1 or other similar systems. It is not a compiler program. It is known as a parameter driven program and it does a wide variety of generalized composition. A most recent major addition to our activities is magazine composition.

The problem is centered in economics. We've tried to do an extremely wide variety of composition. We've been in our field for a number of years but we formed my division three years ago in order to expand our efforts in this area. In doing so, we chose to do a wide variety of composition.

We're struggling at the moment trying to find out, in today's market, which method of composition is really economical to the publisher and will still generate proper return on investment. I have to say that perhaps I'm more confused than most of the rest of the people at this meeting. Three years ago, I could have given you a very good speech on the future of computerized composition. Two years ago, I think I still could have. But today, frankly I'm confused. I think we've proven that you can turn out virtually any kind of a page of composition through a high speed character generator using a computer. The question is: can you do it economically? When you talk about typesetting via computer, the range of application may vary from the simplest form of composition on an inexpensive machine to the kind that we have in our division. We use an IBM 360/40 computer, a VideoComp, an optical reader, Mag tape keyboards and we generate full pages of composition out of that VideoComp. Perhaps a classic example is the mail order catalogue. In going to this kind of work, we have discovered that a lot more detailed investigations are going to be necessary in order to decide what is the best approach. My conclusion is that it is not going to be economical to use these sophisticated

systems in the immediate future unless there are drastic changes in the attitude of the publishers. We have referred to things like standardization. The dream of the publisher, according to Mr. Shatzkin, is to do without hyphenation and justification.

I have made a list of some other things I wanted to ask about. One is the question of letter spacing. We don't feel a composition program can be called a composition program without letter spacing. Many publications are not letter spaced. Is this going to continue to be a requirement in typography? A second question is word spacing. Half inch word spacing is something that I am having a hard time getting used to reading. We refuse to let our people do it and yet I find people today who read certain publications (that have not been produced by us) which have half-inch word spacing, and it doesn't seem to bother them. Another question is the variety and choice of typeface and page formats. We can give our customers a choice of over 100 different "fixed" formats. We felt that this should be sufficient. But to date, most customers(to whom we give the opportunity) request some additional formats! I don't consider this a trend toward standardization of publishing.

I don't see the telephone companies represented here and I don't say this to cast any aspersion on the telephone companies as publishers. But let me just use this as an example. Talk about standardization of format - there are literally hundreds of different formats in telephone directories. Perhaps users of telephone directories don't realize this. One example is the spelling of the abbreviation for avenue. Is it "ave." or "av."? It is hard to imagine that would make that much difference, but it does. We tried a number of years ago to redo some 1500 different telephone directories. We invested our own money to assemble all this data and proposed a standardized system for telephone directories. We gave up. It would have been at reduced cost but this didn't seem to change them.

I brought this up only to point out that for the rest of today and tomorrow I presume that we will have described all these systems that publishers are going to go to. I think it is wonderful; I would like to see a trend in that direction. I don't mean to be critical of publishers; I think they are wonderful. We wouldn't be in business without them. Don't misunderstand my statement. What I am saying is that over the last hundred years our company has devoted most of its efforts to responding to the needs of publishers. And I am just amazed when I go to meetings to hear that all of a sudden publishing is going to be standardized! All that we have been forced to do over these years is no longer going to be important! If that is true, it will change the whole picture. But today's trend to high speed character generation, satisfying a wide variety of the requirements of publishers, does not appear to be the most economical means of doing typesetting.

There are all kinds of photocomposition. When you get into the highly sophisticated systems, it is just not economical to do one-time typesetting by using high speed character generators. When a publisher comes to me and holds up a page and says how much for this piece of composition, I would love to be able to tell him that he is talking in the wrong world. He shouldn't even be asking that question. We should be talking about a total system. The publisher simply doesn't want to change any of his old habits. He wants to give you the same old marked-up manuscript copy. All he wants is one use of typeset material. I am trying to say at this point that the way to do it is not through a big computer and high speed character generation.

SHATZKIN

When we talk about specialized output systems, we are not talking about one but about a series of specialized output systems, each one directed toward a sufficiently large market to justify it. I speak for a segment of the book industry and I wouldn't expect Time magazine to come out looking like a book. It would be appropriate for magazine publishers to have their own specialized systems. What's been said here, I think, by people who are more expert in the field than I, is that if there were enough work to justify the specialized system, then the specialized system would turn out to be more economical. I want to suggest that that might be turned around the other way. If each of us recognizes that we are all different and therefore each suit of clothes has to be measured to each individually, someone has got to come along and say, 'If I can make a large number of suits size 40, I can turn them out by machine instead of individually'. But he might wait a long time for a large number of size 40s to line up in front of his place of business in advance in order to make it possible.

Even the approach described so discouragingly by Mr. Engle can be successful. There are two ingredients: one is to create a specialized system for setting telephone books or novels, which is a different system and makes it less expensive; the other is to sell it to the right person. And I submit that in the structure of a typical publishing organization, the people on whom the salesmen call make it very difficult to sell. The right person to sell is not the guy who specifies the type for the telephone directory or the type for the book, because he is going to want an individual job. The right guy is the man who owns the publishing house and who can be made to realize not only that each page will cost less but also that his designer costs will be reduced. At the present time, he needs a designer for every twenty books. With a specialized system, he can use one designer for hundreds of books and his designer costs as well as his other costs will be drastically reduced. So he has a lot more reason to

support progress than the fellow on whom most composition salesmen are doing their calling and whom they are trying to sell.

TUNNICLIFFE

I think the members of the panel have given a lucid portrayal to the unspoken premise which is behind all of this. The publishers' position is exemplified by their saying, 'You can change anything you want as long as it looks exactly as it looks today'. Now with that as a premise and the specification standardization as another one of the dreams on the dream sheet, the real issue comes down to the business of economic viability and trade-off. It is evident from what has been said that the large jobs that are highly repetitive with high volume justify special programming. It has also been said that you are in a dog-eat-dog world on the per-page price when you talk about the more routine things. But these routine things are really a job shop environment and the thing is that you can't afford particularized programming on these and remain competitive with 99¢ pages.

Therefore, the issue of a generalized program, with whatever modification and segmentation which you might want to make, is to balance the trade-offs between use of machines and use of programming. If you are going to get the job done on time, if you're going to routinize the whole thing, you may burn computer time to do this but you will get the job out and you will get enough of them with sufficient flexibility that you can enter the job shop arena. The culmination of all this is that, if you have high-speed, high-cost equipment, you've got to feed the furnace if you're going to make the investors come around to the decision of having one. So that the generalized language is not simply an academic approach. I think the DCS is visible evidence of the fact that one of the objectives is to handle what you might loosely call the job shop requirement.

I think that the note on which we might properly end this session is to recognize the needs for the two different worlds, to see how they might best be met, and to recognize the fact that both the implementation of successful generalized systems and the standardization of publishers' activities might take a bit of doing.

Panel 2
Hardware

ANDERSSON

I would like to make a few remarks about hyphenation and justification. Everybody talks about hyphenation and justification as though they were invented to meet the needs of the line casting machine. But this just isn't true. The monks, back in the Middle Ages, when preparing illuminated manuscripts, handprinted them so that they were justified. I don't know if they hyphenated. I can't read old Latin well enough to tell. When you set type by hand from a case, you could very easily quad a line out. But always, you filled in the spaces. So this whole business of hyphenation and justification stems from the same reasons I think that geese fly in nice neat little Vs and penguins walk in single file. This is a desire for orderliness, for neatness that people have that has nothing to do with the hardware that is used to set the line. I agree that most of the time it isn't necessary but people have this innate desire for orderliness; they like it and as long as people like it, they are never going to do away with hyphenation and justification.

I do believe, however, that today, in hardware systems, we are leaning too much on techniques that were developed for some of the early line casting machines particularly, and we do things that are no longer necessary for photocomposition machines just because they have become habit. The best example is the duplexing of fonts. Most phototypesetting machines (at least electro-mechanical machines as opposed to CRT machines) are designed in such a way that two fonts, let us say a Roman and a Bold, or a Roman and an Italic, are duplexed. There is no reason for doing this any more. Now people that manufacture the machines will say immediately that the reason for doing it this way is because it is cheaper and that is true, but I don't mean to throw away the features which allow you to build machines with duplexed fonts cheaply. Take a look at a machine that sets four fonts, for instance; you have font one, two, three and four. The traditional method of putting fonts together is to pair one and two, then three and four. This doesn't make any sense, because what you would really like to do in many publications, particularly books and periodicals, is to put Roman, Italic and Bold together so that these three fonts would have the same widths and the fourth font would then be a separate, larger size for headings. You can carry this further if you have a machine which will set six fonts. But the point is that it is as cheap to build a machine that "duplexes" three fonts and carries another one separately as it is to put pairs together into two groups. We're spending a lot of time today in the hardware field on machines which really are based on tradition rather than a real need. The manufacturer who examines the need of the user (and by user in this particular case, I mean the man who is doing the typesetting) will find some very simple things that can be done to machines

which will greatly improve the system capability and cost effectiveness of those machines.

In many cases cost effectiveness is a misused term. I don't want to fly in an aircraft that has been subjected to cost effectiveness programs if the cost effectiveness program decided that the wing that cost $10,000 but never breaks is less cost effective than one that costs $2,000 but breaks on steep banks. Cost effectiveness is misused there. Where you apply cost effectiveness to an overall typesetting system where nobody will be hurt badly if you put in the wrong font, you have another situation. Few systems really consider the overall procedure from the point where the author is typing on through to the mark-up; whether or not it is cheaper to prepare an input for one machine or the other through a computer pass; whether it is cheaper to output from the computer to one or another particular type letter. You always assume those are rather fixed costs and they aren't. It may be very much cheaper to use a particular type of input for a given computer. It is possible today to buy several machines which are computer slave typesetters. They require an input of several frames of tape in order to output a single character. It may not be at all cost effective to buy a very inexpensive typesetter and then require three or four instruction characters per character of text. I don't think that this is very frequently considered. You can include proofing in the whole cycle and consider whether or not it is easier to read proof on a high speed printer or directly from a phototypesetter. I don't have any pat solution to this. I am simply saying that each one of these cases may be individual and that usually they are not considered. Somebody says 'What is the cheapest typesetter?' and immediately runs out and says 'Well, that one is cheaper. We'll buy it.' And that could be the worst possible thing you could do because other factors not considered make it the most expensive. Several of the papers cited in the bibliography contain comparisons of the currently available phototypesetters. These are so-called second and third generation machines. I object to that terminology a little bit because second generation machines usually refer to electro mechanical machines. Third generation usually refers to machines using CRTs, but this may not be true. There are some electro mechanical machines which use more advanced electronic techniques than the CRT machines, so it is not a very clearcut distinction.

I would like to comment next on a standards system. People talk about a standard system for computer input and a standard system for processing the input, but how about a standard system to handle a book. But immediately everyone jumps up and says 'Well, gee, we can't do this. We know that some books require different types and an artist has to get involved or people would never buy them.' Let's take a look at this more closely. Has anyone looked at the sales of pocketbooks over hard bound books? What is a pocketbook - a paper back. All have the same cheap cover; whatever the content, it is printed on newsprint, using some

type style designed obviously for newspapers, yet paperbacks have the highest sales volume in the book field today. The public has accepted paperbacks simply because they are cheap. So if you'd really stand back and look at a book publishing system, is it possible to say, 'Let's settle on a standard size book; we may want to hard back bind it, so that it looks a little better and last longer in libraries. We may want to print it on a little better paper than newsprint because newsprint turns yellow with age. We may want to use a little bit more attractive type style than the paperback.' In fact, you can go all the way; you can use the most attractive type style, the most attractive paper. But suppose you establish that as a standard and you set up every machine in the plant including the typesetter. It probably would be actually cheaper to build the photo-typesetter which would set one line length in one type style. Perhaps Roman, Bold and Italic. Perhaps a headline in one style of type. But a simple fixed machine that read every character which had a fixed pre-assigned value. Now granted, you can't set math on something like this; you couldn't set books requiring complex symbols on something like this. But there is a point here. Once you have this system, you could then turn out books without benefit of artists; the artists would certainly complain, but I don't think anyone else would. I don't think the buying public would. I don't think this has happened or is about to happen. We do hear remarks to the effect that 'Well, each book has to be different', but I don't think they really do if you examine the needs of the buying public and I think the popularity of paperback books has proved this.

KOLB

When I wrote the paper that was prepared for this workshop, I was thinking of the past year and my involvement with the third generation CRT devices which are characterized by the fact that the characters are generated digitally and at some point the characters exist in the stream of digital information. I'm interested in this field for reasons outlined at the end of the paper, which I would like to briefly summarize.

CRT type of equipment allows you to have a very large font library. If you are doing a variety of work rather than a fixed format book type work, you need a large variety of characters for math and for dictionary work, bible work, etc. The requirements are very diverse. Somebody mentioned that they are considering utilizing 15,000 character designations. This type of equipment is capable of providing that quantity of character output and even more. The fact that the range is so great allows extreme flexibility. Such equipment is not conducive to standardization, but it is capable of doing

whatever best suits the job. One of its main attributes is its extremely high accuracy.

The majority of type being set today still uses hot metal machines. Those familiar with hot metal machines realize that the machine will appear to be operating correctly but may not be putting out the characters in the correct sequence or may be putting out incorrect characters. So unless you proof read after the typesetting, you don't know if you have errors. Photocomposition machines aren't this way. They will put out the correct characters in the correct sequence. Being electronic in nature, they are inherently more reliable than mechanical devices and are 'down' less often.

Another big attribute of these systems is the fact that you can insert graphics. Today we possess the capability to produce line drawing and, in the laboratory, half tones. It won't be too long before you can call out line drawings and half tones from these systems in location on the page. With all these wonderful capabilities and flexibilities in the system, why aren't the people using the system making money hand over fist?

My prepared paper shows a comparison of the four typesetters that are in production: the two Linotron machines, VideoComp and our Fototronic-CRT. I have also included, for reference, the newly announced Photon 7000 machine. I was unable to put in the speed of the Photon because the machine hasn't run in production yet and the speeds quoted are from test runs only.

In thinking about what has already been said, I now realize that hardware is really far broader than cathode ray tube machines. It involves also the computer hardware, the inputting devices, whether keyboard, keypunch or a magnetic tape reader. After input, you have the serious problem of editing, a major task in any of these systems. Typically, people make mistakes, and you have to go back and correct the mistakes before you finally publish. There are a number of editing systems in use. We have, as others do, a batch editing system. We have just announced, as have others, a terminal editing system where you can call up parts or all of the information sequentially on the screen of a cathode ray tube. By using the keyboard, an operator can make changes, additions, deletions, insertions and move text around. Coming back to storage, whether paper tape, magnetic tape, or disc file, I think this is a very important part and part of the overall economics of the system is going to revolve about how easily you can make corrections, not to just the content but to the form of what you are setting.

Then you have the computer itself as a major hardware component of the system. Most people tend to take the computer somewhat for granted. They say the computer can do anything and do it well. However, in the high speed computerized system, the computer is the major cost factor. With most of the generalized software, the computer runs perhaps

three times longer than typesetters. Generally, the computer costs more to begin with; you are probably paying 80% for computer, 20% for typesetting. So the choice of a computer, the speed, the storage, how the programs are organized, is very important.

If you are going to more complete page make-up, including graphics, you have to insert hardware which will allow you to input graphics to the system and also the hardware to store it. Are you going to store just a few graphics or a few drawings which will go into a book? Are you going to store all the drawings that go to make up the parts catalogue for Boeing 737? Perhaps you have 17,000 drawings that you want to store and to be able to get at them instantly through the computer. I think that as time goes on, the cost of storage will come down and doing things of this type will become practical in more cases. It is practical in some cases now, but not generally; the cost is too high.

Another major element of hardware in the system is the processor which seems to be pretty well developed. You can buy a variety of photographic processors that will do the job you want to do, whether it is producing a positive image on stabilization paper, phototypesetting paper or film, or a reversal processor for negatives. In addition, several of the systems now offer optionally the ability to come out with a microform 35 mm, 16 mm and in a few cases microfiche directly.

We do attempt at Harris to find out what the user requirements are and to design equipment to fill them. We don't always succeed. I think some users don't always know what their real requirements are. So I am most interested in hearing any comments from the group as to just what their problems are and what kind of hardware would better fit their requirements.

TAYMANS

The first session brought to mind a paragraph in a book "Reading as a Visual Task" by McGleason Moss. In case we think that our problems are new, this was published in 1942 and it says that between the research scientist and the technician in the graphic arts, there has been a degree of common interest in readability but a colossal absence of mutual understanding. Neither has adequately comprehended the other's trade language nor has been willing to use the other's standards of measurement. Neither has adequately accepted the others findings or accumulated experience. The tradition growing out of 500 years of printing has constituted a veritable herd of sacred cows. It is interesting that in a fifty-two page report that the Bureau of Standards will publish within the next few weeks, dealing mostly with readability, the researcher in this case says that it is a fairly safe general principle in the field of legibility that any typographical arrangement that is not extremely familiar to the reader will be less pleasing to him and will be thought by him to be less legible. He goes

on to say in another part of the report that the literature of typography and other matters dealing with the subject contains a number of contradictory findings and considerable conflict on every level, from personal to professional. It doesn't have anything to do with hardware but I thought it certainly illustrates the fact that the people who do the composition and the people who visualize the end product need interrelationships for solution of some of the problems that exist.

I have been working with a small group of printers who felt that the out-put and the high speed, well-developed electronic composer did not need attention but the other end of the process, the place where the manuscript originated, and how you got into the computer, were areas that needed some study and research. This group set about to award a very modest, small contract for an initial auxiliary keyboard that goes with a standard IBM typewriter on a standard system that is available in the industry. The principle involved is that a simple 1-2-3-4 code is used for identifying the typographic formats and the retrieval characteristics of the manuscript. This enables the customer if he chooses to do the format and retrieval coding, to do it very easily because of the use of simple number sets, going from either 1-32 or 1-65. It simplifies the copy marker task. In the simpler jobs, the keyboard operator can put in the codes without actually having the manuscript marked and where it is marked, the keyboard operator is not dealing with a series of letters and symbols but simply with the 1-2-3 depression of an auxiliary keyboard that takes care of the formating codes and retrieval codes.

The system enables you to get into the computer with a perfect tape because all of the tape correction is done off-line from the computer. The method of translating the numbered code into computer readable codes is done on a translator device off-line from the computer. After the set of codes have been produced, you can then take the 1-2-3 numbers for that product line from a translator tape that is on the shelf. Thus, if you are doing the McGleason book, you get off the McGleason tape, and everything translating those numbers is on that particular tape. If you're doing Bob's book, you get Bob's format tape off the shelf and translate the numbers for that. We think this approach has some value. We're only in our initial stage, but we believe (we don't call it standardization of codes or uniformity of codes) it is an approach for the customer where the keyboard operator's job is made very simple, the translation into a more complicated computer language is done by the translation tape. This simplifies the process. We believe the things we are looking for is an economy of time and money, but most of all, ease of operation. The customer can take the proofs, in this case, and read the codes in simple 1-2-3 numbers and doesn't have to do a lot of translation.

If we have the research money, our next step is to test a small system utilizing a keyboard designed by Mrs. Malt of England that will utilize a lay language translation code where the customer will read the words in Italic or Bold face in red as the customer reads the proof. So our effort in this direction has been to simplify and make somewhat uniform those operations that begin with the customer and are accomplished prior to the time a computer compatible tape is generated.

DeWITT

I would like to echo some of the thoughts that were made about justification and hyphenation. It seems to me that we are designing equipment, hardware and software,for our own convenience and the convenience of the purchasers of the equipment but only a few of us have mentioned the ultimate consumer, the reader. If the book and magazine ever do disappear, and I don't think they will, it will probably be because some Nader type gets all the readers together and says 'Give us back our hyphens and give us back our narrow word spacing.' The emphasis on designing for the manufacturer is like the person who designed these chairs. They are designed not for the people to sit in, but for the people who handle them. You can't lean back in them, but they are very easy to stack.

SCHUBERT

One of the publications made available to the participants of this workshop was Ray Lannon's report on justification equipment. And for this report, we actually set on the VideoComp thru the RCA Spectra computer the eight pages that he refers to. One thing happened when we compiled our own cost in shop for setting these eight pages. We found that 8% of our cost was in the VideoComp; that's allocating a regular dollar amount of the amount of time we spent on the VideoComp. 16% of the cost was in composition on the computer. 17% of it was in materials - photographic paper and film. 59% of our costs were in keyboarding. This opened our eyes. We had been looking at this direction earlier but it was quite a rude awakening for us. I believe that some of our customers, some of Harris' customers, have been experiencing this in their own shops. We are concentrating our hardware development in the future on trying to attack the major cost areas. We presently have in the VideoComp a small data processor. We can set text material, full pages on full size; we can also set it on microfilm. We think one of the trends in the future will be more towards microfilm to reduce the material cost. We are adding peripheral equipment to the VideoComp. We are attempting to combine text editing, composition and typesetting all in the same device. We have added scanners for line drawing. We will have scanners for half tones. We hope in the future to be able to do optical character recognition. We will be adding keyboards to the VideoComp, probably of the mag-tape cassette type. We believe that batch entry of data, play-back and complete editing prior to going to composition and type-

setting is one of the major cost areas that should be attacked. We will be adding other communication equipment, printers and card readers. We are trying to reduce the 16% computer cost. As Mr. Kolb remarked earlier, the computer is generally running three times as long as the typesetter. This means that if you run your computer for three shifts, you only run your typesetter for one shift. Well, if you're going to run it for one shift, let's put some of the composition right in the same device and lower the composition and typesetting costs. All these hardware features are dependent on software. We are moving our software into the VideoComp itself. We already have video text which will take a standard line printer tape and produce it directly to offset plates. We will be providing in January a file comp system which will take a standard magnetic tape, which is designed for batch data processing. No typesetting commands in it at all. Theuser program in the VideoComp moves to composition on the first batch and typesetting on the second batch. We expect to have, some time next year, a text publication system and a text editing system available on the VideoComp itself. What we are trying to do is to attack each of the areas of cost. We find that keyboarding, materials and composition all play a bigger part in cost than the actual typesetting.

HARMON

I am with Information Internation, Inc. and am the President of the National Microfilm Association. I come from outside the problem area and I say that the microfilm industry as such has literally backed into the printing industry. Texts have been microfilmed for years but after the printing. You find them in your libraries; you find them in your work areas. But now we have moved into the direct microfilming of materials and that is done with the COM devices, computer output microfilmers. The first area into which this technique has moved is the micropublishing of technical data, specification sheets, etc. Micropublishing is known as that process by which you come out with a microform and distribute your information in that form and it is a budding but moving industry. Until very recently there were no devices capable of producing the quality that was necessary to match what is printing quality. But that is no longer so.

A second area into which microfilm has moved is being an intermediary for publishing. This process includes making microfilm from a COM device and then making a plate which can be used in offset printing.

Another area into which microfilm is moving is as input to computers. These devices will take information that is on microfilm, scan this microfilm, and then interpret it. Digitizing the information, whether it be characters, symbols or text of any kind, or whether it be graphic, or complete photos, can be done with microfilm as the intermediate to the computer. Then that information can be prepared for editing with the typographic construction, etc.

One of the major areas in which this technology will be used is in the locations where there are a lot of books deteriorating and must be republished in one way or another. The use of microfilm is accelerating. Mr. Spence, Public Printer of the United States, has recently announced that all GPO items will be on microfilm. This is a formidable challenge to both the microfilm and printing industries. One of the things that Mr. Spence has asked for is a standard - an absolute single output standard. He has asked that the ratio of the image on the film to the normal output be 48:1. This suggests that 48x reduction will be the standard and the images will be on fiche.

BUCKLAND

I am the President of Inforonics and since 1963 have been working in the field of text processing, which I define as the use of computers to manipulate words and numbers. Early I found that lower and upper case type could be printed by a computer, but by very arduous means. I've been through the problem of only setting hot metal type by computer and from there to the problems of electro-mechanical photocomposition machines and, finally, highly reliable high speed CRT machines. The transition through these phases entailed progress and problems and high cost; however, I don't think the problems solved are anywhere near as difficult as the conceptual problems involved in designing the data bases which one needs in these computer systems if one is to do information retrieval and publishing. A distinction between intellectual structure and hardware problems must be made if we are to attack this problem. The intellectual structure, mentioned by Mr. Tunnicliffe, is part of the typographic problem and appears in two forms. The first one is where the intellectual structure is exactly defined and some one has taken every element in the data base, described it properly, and prescribed what the typographic or the form perameters to the output should be. When one does this and runs a few trials, things usually run quite well. In the other situation, when one doesn't define elements of the data base and enumerate all the requirements, one runs into problems in production. A good service company works with the customer and helps him out of whatever difficulties there are and doesn't hide behind contract formalities. This data situation makes the costs go up. I would suggest here that it is important to work on the data base analysis problem. I think that there is a lot more work to be done in any such System X design as was described earlier to complete the conceptual analysis and data base structure.

JONATHAN SEYBOLD

I guess we all feel apologetic for being on the hardware panel. No one seems to think that hardware is a problem any more. I can certainly recall, only a few years ago, when hardware was the problem. The biggest bottleneck we had was getting an output device that would work with a computer and set type without introducing all kinds of new errors.

It seems that the story of computerized composition has been one of shifting involvement! You begin to attack one bottleneck and you became aware of problems existing elsewhere, but they just were not as important. Now, everyone seems to be worried about input and the structure of the data base.

I do not think that the hardware problems on the output end that plagued us earlier are solved. Unlike Mr. Andersson, I do see justification for calling the CRT devices third generation machines. The third generation approach is to problems of storage, selection, sizing and display of characters. I do see a substantial difference between this and the electro-mechanical devices which preceded them. People who have been involved with computerized composition and have used both kinds of devices have generally found that the CRT devices are far more reliable and far more conducive to being used as computer output devices. Therefore, there is still an output problem to be met. I can't see with existing technology any real reason why CRT devices have to cost $350,000. That is ridiculous. No one needs a thousand, two thousand, five thousand characters a second - or almost no one. There are very few applications where that type of speed is justified. So, there are still hardware problems to be faced at the output end.

Turning to input hardware, I see an increasing tendency by a number of firms toward generalized input using easy, readily redefinable fields and codes to identify data elements in an input data base. This is obviously preferable to putting in long strings of very specific command codes. I am still a little bit surprised, though, that so many firms think they are unique in doing this kind of thing. Most of the firms with whom I have had dealings with do input in this fashion. It doesn't always mean that people use the same codes in the same place, but the intent is still very much the same. I think that there is still a great need for better input devices, especially devices that would facilitate this kind of coding.

In most of the other areas in which we face hardware problems, they are really not hardware problems alone, but systems problems. The whole question of corrections is a good example of this. Better solutions to this problem will probably involve an integrated hardware, software approach.

This brings us back to software again. We started talking in the first session as if PAGE 1 (or copies of it) is the only composition language. As a matter of fact, we should realize that the majority of computerized composition in this country is not done through PAGE 1 type systems. The large bulk of it is done through 1130s, PDP-8s, and other more primitive systems. Even a lot of people who are using the larger computer systems and high speed CRTs, etc., are not using the PAGE 1 language. So if we continue to assume or talk as though the trend is toward the use of large compiler systems, we may overlook a large portion of the field.

MEADE

I agree with the position taken by Mr. Tunnicliffe in his paper, particularly with regards to the input language. Input hardware should be designed to facilitate this universal input of language, if at all possible, It should be implicit in the design. At Computype, we have attempted to keep input as independent of typographical perameters as much as possible and to apply normal data processing techniques and to avoid those special problem areas as regards special procedures, personnel problems, or equipment.

Input terminals and CRT terminals in general have built into the hardware many of the editing procedures that one would like to have in a program. We need these kinds of capabilities and to program these separately is very difficult. I view this as a very good area for future progress and I would like to think that improvements here will help solve some of our programming problems.

BUCKLAND

The last point that was made, I think, is a good one. I happen to be on the other side of the fence and until I really know what is going to happen with this man-machine interface, I would like to do all my editing by programming. Let me give an example in an area different than that of coding, Library of Congress Mark II bibliographic records. We do a lot of proof reading by a complicated computer validity checking process which costs 1¢ per record. Now we also have to proof read the spelling and that costs about 20¢. You are not going to get the level of logic that you need to do this kind of a computer aid to the proofreading process in any hardwired system, so I'm still voting for program control.

These editing systems are moving to time-sharing computers with remote terminals. If you can have editing systems where you catch errors as close to the author as possible, and fix them, you save a lot of collating, stacking things up in piles and putting them in in-and-out baskets and all the rest. And so this whole keyboard-editing-proofing thing may end up being done very nicely from one place and with the processing intermingled. I can't see how to do that with hardwired equipment.

MEADE

I didn't mean to imply that the approach I described is the only way. Once you determine your error, how are you going to correct it. And here is where the very basic problems of just correcting that single character that you want to get at, is solved by the terminal. I think an error correction program is an obvious necessity but it has to be related to the particular application you're talking about. And you cannot in general say that I have a particular program that is going to check any or every data base. It doesn't make sense.

BUCKLAND

Yes, but there is a class of problems where you have the computer bring up something which has a probability of being wrong and then have the human make the final decision. Too often we want the computer to have complete error correcting codes which are just too complex and not worth the expense. A computer can find an error; but I hate to see it find the error, dump it out on some proof slip which is then routed to the guy that fixes it by writing down instructions and sending them on to someone who carries out their instructions.

JOHN SEYBOLD

Well, I'm rather shocked at this panel because it has ducked the whole question of hardware as though the hardware problem was solved, but it isn't. For example, one of the things that we've got to have is the ability to access type characters to look at full pages before you make changes on the CRT. If we're going to look at the material and then react to it, we want to be able to see the type. And in order to see the type, we want to see, if possible, the characters in their proper place. This isn't that big a deal really. The characters are already in storage. They are available to the video console. The Federal Systems Division of IBM, and RCA, have both played with the problem of representing a page in terms of blocks. Their systems provide some kind of symbolic representation and a joy stick to zoom in the actual text. But we need a way to let people see more than just the symbolic representation. We are going to overwhelm the editors as long as they have to work with symbols and abstractions. We want to enable the people whose data it is to see something very concrete and specific. I just don't think the hardware people are facing up to this. I think we need imagination. I think they, like everyone else, are bogged down in software problems and they feel that until these problems are solved, they can't go forward in hardware development. I submit that there is a lot to be done in hardware development. But we need to give the hardware people definitions of what it is that we want. I think it is the responsibility of the participants of this workshop to come up with some useful suggestions to the hardware manufacturers.

DOLBY

I am a little shocked, too. We were informed by an earlier speaker that 16% of his costs were in the computer and 8% in the VideoComp. That means that two-thirds of the hardware costs are in the computer. Now I have not heard anybody suggest how we are going to improve the computers. There are members here from IBM and RCA who produce computers. The primary thing our industry wanted in the third generation machine was the ability to access characters instead of what were suphemistically called words in the earlier computers. This reduced computer costs by order of magnitude. There are other possibilities and I would be very much interested to hear from RCA and IBM as to what they are doing in the fourth generation which will make our job easier.

HARMON

I would like to point out that many COM devices have a remote viewing screen which displays an entire page or a part of a page. So those who are designing the COM equipment have looked at the problem raised by Mr. Seybold.

JOHN SEYBOLD

What about proportional spacing?

HARMON

The higher quality units, such as the Information International unit, display proportionally spaced characters as the page is printed on the film.

BLUM

This is in answer to Mr. Seybold's question about the scope that has proportional spacing. A number of companies are, in fact, producing such a device with proportional spacing as well as a variety of size representations and some, even with capabilities for hyphenation and justification. You will be hearing of them and probably seeing them before June, 1971.

KOLB

I would like to discuss a CRT system that uses the characters that are already stored in the photocomp CRT to make a page display to show what the page looks like so that you could interactively correct it in softform before you commit it to hardform. The reason my company has not produced equipment with the full quality of type is that the equipment appears to be too expensive to have one or even ten people sit down and use simultaneously. It looks like the economics aren't right at this point in time. Mr. Blum pointed out that there are at least three manufacturers producing equipment of this type. They probably do not have the kind of type library or definition that Mr. Seybold would really like to see. However, these might be adequate to do the most of the layout work required to be sure that the software is producing what you want.

We are coming out with a terminal for display ads which will show characters on the screen in various sizes and will also show the correct number of characters in a particular line for the selected font. The display shows simultaneous representation of the type to size and line length and the control function. Groups of lines can be combined, as desired, for the display ad. The operator can change either the control structure which is over on one side of the tube or he can change the text. And if you change the control structure, the display immediately changes in response to whatever control you inserted.

We have talked to some people about what we would call a publishing system which would work in this fashion. It may be composed of either a major computer center or a number of small computer entities. In either case, you would have input keyboard for keying original information into storage and you would have display screens where you could access and display any piece of information that you want, show it on the screen, correct it, put it back in storage and do this as often as you want. You would have terminals on which you could lay out your pages for magazines, newspapers, books, telephone directories, yellow pages, or ads. You could actually block them in, show multi-columns, enter in the format data through the terminal to do the page layout. This on line into the computer system. You would be able to scan in graphics, both line work and continuous tone drawings. The computer would screen and half tone the continuous tone drawings and work the tonal scale as you desired. The system would keep track of where every page of the publication stood as far as content, whether it was complete or not, would furnish back information as to what had to be completed before the button could be pushed to go through the actual composition run and come out with the full pages.

Now that is rather a complete system and I think it's a ways off. All the elements are in hand today in one form or another. All the software is within possibility. Whether it can be constructed to operate economically, nobody knows. I think it will be a while before we find out. It tickles the imagination, though, as to what the possibilities are. Visualize the editor sitting there at his desk containing an editorial screen; he shortens or lengthens his article; he makes a few changes or updates it to the latest information, right up until the time it has to go to press. At that point, the production people take over and press a button that sends the material to the composition system, the typesetting system, produces full pages, perhaps directly onto printing plates.

JONATHAN SEYBOLD

My only comment to that is 'When can we have it?' That is probably the kind of systems analysis that is required for proper hardware development in the future. It is very difficult to design a piece of equipment to fit into a system when you aren't sure what the system looks like. This may be part of the reason why we feel very apologetic about being on the hardware panel. It is not too difficult to talk about hardware that is doing a relatively well-defined task like laying down characters on some sort of photographic media, but it is very difficult to talk of other hardware except in the context of overall systems requirements.

Let me give you two examples of how a complete system approach can result in some interesting uses of hardware. We have often said: "Wouldn't it be nice if we could do page layout on a CRT terminal", but lamented the fact that video terminals are not big enough to display an entire page of text. Well, Time-Life has a VideoComp 822X running in the laboratory generating pages of Time magazine, among other publications, with a Techtronic scope wired to it. A page of material can be generated on the face of this video display terminal. You can generate it while the machine actually is running or you can turn off the CRT and the film carriage in the typesetting machine and just generate it on the face of the scope instead. Thus the operator can see the page before it is produced. It is quite legible on the scope, which surprises everybody, including Time-Life people. This sort of technology exists now, and Herman Parks tells me that you can even use larger pages than the pages that fit on the scope. You can regenerate the page at reduced size - you can't read it terribly well but you can "zoom in" on a part of the page you wish to view.

The New York Times information system, which will soon be operational, will involve CRT video terminals in a dramatically different application. This is really quite interesting because, like most video terminals, these terminals are just small television screens. They have a double controller - one that generates characters on the face of the CRT so that it is easy to converse with the computer, ask questions, prepare data, etc., in a conventional manner. By pressing a switch, the second controller comes into play and the unit becomes a standard television receiver.

When you want to see something from the New York Times microfilm library, an automatic film retrieval system selects the proper frame of microfilm, puts it in front of a TV camera and displays the image for you on a screen.

Thus, the systems needs have existed; some people have found ways to do some really quite creative things. It still seems to me that the hardware problem boils down to a systems problem.

ENGLE

Several people have commented about being disappointed. I think I would be remiss if I didn't say that I am awfully disappointed too. I came to these sessions not only to contribute to our collective knowledge but also to try to get some answers. I think I said earlier, I'm frustrated. I'm not getting those answers. And yet gathered in this room is the greatest brain power ever assembled on the subject of computerized composition in this country. But I am not getting the answers.

Let me just comment on a few things here. What I heard on the subject of hardware was that most of you would

rather talk software. Now I am well aware that it is difficult to draw a line between what is most important in the field - software or hardware. But let's talk about the hardware for a moment. I do think we have problems. Let us talk about it in reverse order. Let me tell you about the output devices. We were encouraged when we came to this session to read Mr. Lannon's report. I didn't read every word but I scanned it and I drew a conclusion. We ought to have a Linotron 505. We don't have one. I haven't heard anyone discuss it. I'm well aware of the economics of the VideoComp and to some extent the Harris Intertype. Who is going to talk about the 505? What is it? Do you folks have the answers and is everybody trying to play coy and retain their own answers? Or does nobody have the answers? I am willing and trying to be open from our standpoint as to what our problems are, what we are facing up with and I am willing to answer questions. Why won't anybody talk about the 505? Should we get a 505 or shouldn't we? What is it good for? What isn't it good for?

Let me discuss the computer problem. We're using what is now called a medium scale computer, the IBM 360/40. We used to be told it was an awfully big one. It is up to its eyeballs in work right now. We are working it three shifts a day, seven days a week; we have a VideoComp which is busy about 20% of the time; we are right now deciding whether to get another 360 or a Spectra 70. Do we get a couple more to keep going with these? Are big computers the right way to go? Now my bosses, and I am sure many of yours, are reading daily in magazines all about this great new mini-computer field, not necessarily relative to typesetting but relative to all other types of applications. All I have ever heard about mini-computers is that they don't have enough core, they will set a newspaper if you can live with half-inch word spacing and miserable hyphenation right down the line, but they are not capable of doing quality composition. Does anybody have a small computer which you can use effectively to do good generalized composition?

Subject number three is keyboarding. You have the question of paper tape keyboards, mag tape keyboards, CRTs, and, nobody's mentioned this one so let me mention it, punched cards. Sounds second generation or first generation but I have to say that we are seriously considering should we go back to punched cards? Pretty sad statement to make, isn't it? We've got mag tape keyboards. These are the best input and correction system that we know is available in keyboarding today. We looked carefully before we got those keyboards. We looked at 29 different input keyboards and we choose this one. The others that we looked at had all kinds of problems. You get limited character set on most of them, which causes you to have to strike more than one key to get the characters that you need. You can't get a different colored print as you can on the ones that we use. We can get a red print of all of the parameter codes. They stand out from the text. As far as I know,

that is unavailable on any other keyboard. On the one that we have, its biggest problem was the fact that you ended up on DEC tape and had to convert to the IBM tape. The conversion was a nasty problem on occasion. It ran beautifully until you were in a tight production schedule. I presume that this is the same problem that exists with the new ones that are on cassettes. I would like someone here to discuss it.

There is the question of the CRTs and although we did in the question-answer session here get some comments on CRTs, I'll have to say that we haven't gotten into them in too much detail.

KOLB
Only for corrections. (Editor's note: several other expressions of agreement were noted.)

DUNCAN
The question here is how much facility can you put at the disposal of the responsible author. I am still concerned about that author as the user. The words 'original input' bother me and I am interested in the cost figure. But let me describe an experiment that I happen to be running: everything I write in manuscript is transcribed by a typist on a recording typewriter that includes all memoranda, even the little ridiculous memoranda that told Bob Landau that I was coming to this workshop. Now, I did this on the thesis that in trying to capture information from a scientist, a scientist and his typist form a partnership. It is not as unequal as it is sometimes supposed.

I don't know how much money can be afforded to support each responsible creative person. It may require devices that cost five or ten thousand dollars. Would it make a difference in the publishing business if we assume that every source of something that we might want to print would be supported by a recording device that would have at least a printer-editing capability based upon cassettes? And if that kind of thing existed, would it make your picture of how this input flows into the publishing business different? Could your creative sources be supported by five to ten thousand dollars plus a secretary because that is about the range that we can get into today.

LANDAU
That description brings me visions of the paperless society. What is the implication here for the printing industry?

SITES
Unless you do your own typing, it is very important on any kind of an input terminal, if there is a keyboard, that it be able to be typed on by a secretary. I never learned to type and when I went to work for the government, I didn't get a secretary, so I type. Fortunately, I happen

to have a terminal that works and is effective. But I checked a lot of equipment before I bought. The major point for rejecting any terminal in my evaluation was that the keyboard was unworkable for a typist. Terminals have often been designed for the programmer, who for the most part is a pretty bad typist. He doesn't care about speed. He doesn't care about whether or not after that carriage returns you have to wait for three seconds. I have worked in a company using an on-line terminal system that was very good but the corporation secretary to the President never used the system. She typed too fast for it. And this is very, very common. I think hardware manufacturers have got to realize that time-sharing is becoming the thing; everyone is going to have a terminal; you're going to make a lot of money; but you've got to design for your user, a typist.

CARLSON

Speaking as editor, I have the notion that some editors can type and there is a possibility that a terminal might be designed for an editor to do his own creative work by capturing this creative information right away. One interesting piece of hardware coming out in the woodwork along with all of the others is one that Miss Sites might be interested in. The equipment interfaces with an IBM selectric typewriter (how many of those are there?) with a fairly high resolution CRT and auxiliary side keyboard for editing functions. Anything you can do on the selectric you can do on the face of the screen. A secretary could type a letter for her boss, type a manuscript on the tube, correct it, play it out on some sort of auxiliary storage and, if she wanted a hard copy, play it out at 15 characters a second.

SLATTERY

I would like to address my comments to Mr. Engle. I was hoping that I could save this until tomorrow because I think the 505 definitely does fit into this market place from what has been described. And I think it fits the systems configuration more so than just as a piece of hardware. Mr. Lannon's report has shown that a typesetter is needed by these people for under 1000 page job productions. The 505 is one of these pieces of equipment that has to be used as a computer device rather than a keyboard entry device. When it was intoduced into the market place, it was introduced as a keyboard entry device. The way it has been utilized by the users is mainly as a computer operated device. Our experience has led us to redesign the 505 to make it truly a computer only typesetting device which will be set up for this particular market.

LANNON

I should like to make it clear that I am not peddling the 505 or any other system. As well, the 505 alluded to in my study is a special configuration built by the Computer Typesetting Research Project of the University of Newcastle-upon-Tyne. They combined a mini-computer and part of a standard 505 in one piece of hardware. Thus the

study machine is not typical of the 505 being marketed by Merganthaler.

Secondly, you must read my report in context. One of the sample pages is negative on the 505. That is to say, it never reached a break-even point. Also, when comparing the 505 to linotype for the pages set in a mix situation, it required 197% of a shift of 505 time to reach a break-even point. In other words, you were almost into third shift operations before reaching a break-even point. Please look at the numbers and draw your conclusions carefully.

WIGINGTON

I would like to come back to some of the hardware questions that were raised and express some opinions based in part on my earlier days as an equipment designer and in part on experience at CAS that I will comment on in a later session. First, some specific responses regarding keyboard devices: our own experience has gone from paper tape to magnetic tape devices, bypassing the CRTs for the time being, and now to multiple keyboards on a small computer, without feedback hardcopy or softcopy either. I think that this is one of the questions that might bear some attention; that is, whether the feedback hardcopy in a high volume production shop does any good or whether it does harm. In our own case, my personal reaction to it, if I had to do the typing, would be I want to see what I'm typing so that I can go back and pick up mistakes. But for a skilled typist, feedback copy does nothing but slow her down.

The first time we see hard copy in our system (including the original input) is after the item has been dictated, transcribed, edited by machine and photocomposed onto worksheets. The role of the CRT in editing is an entirely different matter and our experience doesn't extend to that device yet. As an old display designer, I think it is obviously the way to go, but we can't prove it as yet in an economic sense. In fact, most of the figures that I find go the other way, but they do not consider overall system restructuring.

If one were trying to specify what he would like to see in output equipment as part of the system, not from the point of view of buying services but rather in building a system, our experience leads us to a number of conclusions. We need the usual good quality, flexible character set. We need line drawing capability; we do not need half tones, others do. We need a proof generation capability until such time, if it ever occurs, that the online softcopy editing does come through. Until that time, we need a way to generate proof copy in a form so that the person who reviews it can verify that the information on file is accurately what he wishes finally to appear. We can accept a lower optical quality certainly for such a purpose, but we still would like to see the same richness of representation that you would expect to see on a final copy. We haven't

done the human factors study to determine any numbers about how much improvement in proofreading or content checking that this gives us. Certainly the response of the profesionals who are concerned with the content, when we went from line printer output to photocomposer output, was enthusiastic; they saw the output as they finally expected to see it.

As the world moves into micropublishing as a significant publication activity, it will at some point in time seem a bit indirect to go to paper and then photograph to go to microfilm. Then microform direct output will be important. Full page composition, I believe, is a very desirable equipment capability. We now don't have that; we use column composition. In our next installation, I'm certain that will be one of the things we look for.

As for the major system problem, my own view is that it is a software problem and not primarily a hardware problem, and by that I mean the whole subject of data base organization, data base management and design in which you can have some degree of flexibility to adapt to changing needs. Human factors have been raised in the design of the keyboard equipment and other things, and the comment about the computer terminals being designed for the programmer is very true. It reminds me of an experience I once had in which we designed a console. It had everything but the kitchen sink - keyboards, knobs, a RAND tablet, light pen, a track ball, the whole works! The keyboard looked like a selectric typewriter because we thought that was a good model to copy for a design and we programmers used it very well. I asked my secretary to try it and it practically drove her wild. It was a very silent keyboard. By now it is well known that the click one hears is a very definite part of the feedback in using a typewriter. This is only a very minute example of subtle human factors problems. There are many things of this nature for which the human factors design would have to be considered in such systems.

LANDAU

I have observed that the word system is probably being used different ways by different people. Let's be sure we differentiate between computer systems, which are designed to make a computer work well and the idea of systems in the theoretical sense. That is, those philosophical and conceptual relationships which make something happen well. And a third interpretation is a system that is actually operating in a particular situation, for example, an existing printing system. Now these three systems are quite different things and the systems that we had in mind for the next session doesn't necessarily mean all three of those. I had in mind for this session that we would be talking about computer systems as part of hardware and the other two kinds of systems as related to but not part of hardware. We should be careful not to confuse these three concepts as we talk about the system.

BUCKLAND

All the problems that we have had in the past ten years demonstrate that we haven't studied our Roman history well enough. Everyone knows the early Christians get the best lions. With respect to computers, several of us have already said that techniquewise or equipmentwise, the computer we have, which is really a time-shared mini-computer, is working quite well. This would seem to me to be some evidence that this is the direction things are going. I'm quite sure there are any number of equipment manufacturers that would fashion any system for you and give you just what you want. The answer to the whole question of equipment selection, whether mini or maxi, is to rent. There is one problem that I see on the horizon; it is presently not available; it hasn't even been mentioned here today; it is the growing need for wide band, on demand telephone service. I have already said that if you can time-share things, then an editor can have terminals and you can get over the problem of 'do I need a big computer?' by having ready access to a big one some place else, where you buy a small part of the time. But, if you don't have a small steady work load but rather you have spurts, you pay certain penalties. Lots of these telephone systems are very cheap if you are sending billions and billions of bits all the time but if you are just doing it now and then, you will pay a relatively high price for this. I'll describe a practical example of this related to CRT editing terminals. We operate a standard 611 Techtronis CRT hardwired into what I used to think was a big computer but is now considered a medium computer, the PDP-9. This is a $3500 terminal, $2500 for the Techtronic 611. We hardwired the display to the computer and generated characters by the computer which makes the terminal low cost. But if I take that $3500 display and take it away from the computer to connect it by dial phone line (a nice standard thing that everybody can plug in to), I suddenly find that I can't generate those characters away from the computer because the band width requirement is too high for the phone line so I must chug along at slow phone line speed. To get around this, I must build all that logic and memory into the display and my $3500 display has suddenly become very expensive. This is one of the first examples I have found of the communication band-width problem.

I don't know which I like best: centralized versus distributed computer processing. Any approach that I would develop would be quick on its feet and able to go either way. You pay your money and you take your choice. With limited memory and logic of a small distributed processor, you can do only a certain kind of job. You really run out of gas when you start to demand complex editorial functions. Our experience is that once one of our systems is running smoothly, everybody, from the boss right on down to the programmer, thinks of new things to do and incorporating these new things always keeps you in the process of development. The thing that happens is that you need more and more computer power all the time and again you don't need it in the steady

state situation. In our publication The American Heritage Dictionary, we made an 800 page dictionary in three months from the existing data base. We had five terminals going through a million dollar computer all day long for about two weeks. And then we had no requirements for a while, creating a tremendous fluctuation in work load. You need to build this flexibility into your systems requirements.

However, there are some good distributed processors, for example, the Astrotype mentioned by Mr. Engle. I think it is a very good system myself for I've seen it used and it appears to work very well. I have always been an advocate of CRT editing and I worked on it for some time, but I see many equivalent functions being done by systems without CRTs.

JONATHAN SEYBOLD

I would like to make one comment in response to Mr. Engle's anguished plea. I think what struck me as the amazing thing about this gathering is that we have here a sort of 'summit meeting' of a number of people in this country who have been involved in this subject for some time and who are supposed to have all the answers. But many of us have come to the realization over the past year or so that maybe we don't have many answers. And that is a frightening realization. We thought we knew the answers a while ago, but most of us now realize that perhaps we didn't really even know all the questions. That may be the major contribution of this meeting: that we finally admit this to ourselves.

HENDERSON

I disagree with the last statement violently. As a group, we have a large variety of answers to a large variety of different problems facing this industry.

The hardware problem is minor compared with the total communication problem of transferring information from the generator of that information to the final consumer of the information. Adequate solutions to input, processing and output hardware are now available. What is not commonly available to the publishing industry is a total system of utilization of these new tools.

Adequate generalized software has also been developed. Yet, neither the software nor the hardware is being utilized to any great extent by the industry. This is partially due to the cloak of secrecy about what each of us has done. I have been involved in working toward the development of three different large-scale information systems that photo-typeset. We spent in excess of a million dollars in the process of doing so. Each group developed its own software, never telling anyone else about the software. I watched at least two different companies use the original TPS system for four and one-half years and still only utilizing it on a few jobs. To amortize that piece of software properly,

it should have been used on a hundred jobs or more. We should open up this cloak of secrecy to where we can mass produce a product that our customers can use and trade ideas, perhaps losing certain trade secret advantages.

BUCKLAND

Just one quick comment on this secrecy question. It's not just that. More than one of us has gotten himself somehow obligated to explain to someone else how a system works and have incurred tremendous costs. You give some guy a program, here it is and here is what it does, and pretty soon the phone starts ringing and your secretary can't answer this. It is your highest paid programmer that has to answer these questions and so I think there has been some of that as well as the proprietary questions.

ANDERSON

I have some insight into why the Linotron 505 is not selling like hotcakes. If you take the other three machines, the VideoComp, the Harris and the Mergenthaler 1010, and compare them just roughly, the 505 goes at 1/12th to 1/24th the speed and costs about a third as much. If you look at the little $10,000 typesetters, they go 1/25th the speed and 1/30th the cost. So that's not a bad match. It just seems that it is a little off the cost performance curve. We've been asked 'does anyone have any mini-computers used for quality typesetting' and it all seems pointless to say anything about this because the people who are using 360/40s won't believe you anyway. This is generally true. For most typesetting purposes the power of a 360/40 is useless. Business Week started originally two years ago using a PDP-8 for a complete typesetting and editing system which has some very nice editing and correction capabilities. It includes all of the pagination that can be done with the typesetting machine they are utilizing. People who have come in and looked at this system who have been working on larger machines won't believe it. They will stand there and watch it and say 'You can't do that' and walk away. All of McGraw Hill publications now are being set through this system. It was originally installed to permit them to typeset in two different locations while they were doing all the computations centrally in New York City.

It is very easy from the standpoint of capital equipment to modify software. All you need is a piece of paper and a printout of what you have already and you can go around modifying the software. Whether you do this sensibly or not, that is all it takes. But to modify a piece of hardware, just to modify a simple typesetting machine to change the codes, it may take a couple of thousand bucks of test equipment as a start. So you just can't talk about doing that as easily. You go on from there to build a new piece of hardware that may take a plant and capital equipment of a couple million bucks and a couple of years development time before everything is set up and documented. So it's a different ball park. Everybody likes to talk about

software because it is very easy to at least think about the changes. It may be impossible to write the program to do whatever you want done, but it is very easy to talk about it and it is very easy to start it. Take a piece of paper, write the first line of coding and you write the first statement and there you are. You have started. Whereas to design and develop hardware is a very different situation.

The thing that you can always say in a general statement that you make about the cost of computer hardware is that it is going down and you can throw in all the bells and whistles that you like. For instance, with the first generation, the vacuum tube machines, it was very difficult to manipulate single characters which is why there were no typesetting programs for Univac I and so on. Of course, if you really wanted to manipulate a character, it was possible. All you did was shift 119 characters to the right and that lost you all those 119 characters and then you shifted back. It made the operation fantastically expensive. So all we are doing is bringing the costs down with each new generation and some of the new generations of computers that are coming along have fantastically low hardware costs.

Just a little beyond the point where we are now, we can see coming large subsections on single chips, integrated circuit chips, so that the cost is going to go way down. And that's the only general statement that you can make. You don't gain any more flexibility in the computer system. It may be easier to use, yes. But your computational cost is lower and that is really the major way it reflects back to the user.

PARKS

I have seen some fortunes disappear down that one line correction. I never underestimated hardware the way I've underestimated software. There must be something about it. It is so deceptively easy and comparatively simple that you cannot understand where the money goes.

ANDERSON

That was just my point!

PARKS

I want to respond to the points you made, Mr. Engle. That was truly a good challenging set of questions taken one by one and all together. I think the answer has got to be found in the point that nowhere in this room is there a commonality of need, objectives, system requirements, and, therefore, the machinery, software, hardware, anywhere has got to be each person's or organization's individual objective. We sit here and talk about photocomposition as if it were all the same, about the computers, about the programs, and they are so absolutely different that there are as many answers and interpretations as there are number of people in this room. What is really coming clear is that it is taking a long time for us to learn some hard truths in this business. One of them is the one that I just gave: you can't go next

door and borrow a system.

I talked to our EDP expert at the lab the other day. I said the Harris Intertype system at McGraw Hill impresses me very much. We've had people down there time and time again to look at both the input system, the computer system at the main building and then the printers, Williams Press in Albany, Kreeger at Milwaukee and we're impressed. We think they have done a terrific job. Then I asked the EDP expert: "Why can't we save a pot of money by taking that system that they have all packaged and ready to go; we can get the various companies to sell us the products; why don't we consider bringing that in and replacing what we have going?" He said: "Well, if you're willing to give up .....", going right down the line and reminding me (and I set these original objectives) of what it was we put in our 360/40. And they were put in there because our editors did their job in a certain way; they required certain servicing; and we predicated a system upon continuing those services. Therefore, we have our features; we have our fonts in there; we have a 99% hyphenation program (does anybody in the world need a 99% hyphenation program?). All I know is that hyphenation is a way of life. It is almost a religious matter. Am I going to go down there and tell these cats that this is nonsense, that many of your readers are so stupid that they wouldn't know whether we hyphenated or not? Of course not. I wouldn't do anything of the sort. I am going to give them the hyphenation system they had before.

Now, it might be that if the editors were squeezed today, 1970, with things like considerations of lower profits, maybe they might relinquish it.

I think the basic answer to the problem is that you must do better systems analysis work. This is the conclusion that we came to. Today we have the systems analysis tools and one of the most valuable things in the world, experience. Each of us has some of the pitfalls that we can call upon and the answer is not to go back and talk about a 50%. The 50% is right in certain systematic contexts. The designer sits down and puts together thirty things, maybe fifteen are hardware and fifteen are software. The boundries are set in his own head because he is capable; maybe he trades off a black box with wires in it for four hundred lines of program over there. Then later on he makes another swap back again because he has the CRT and he can get rid of certain amounts of programming because it has certain basic functions inherent in it that will save a lot of routines. He's got to take all that the he's got to make a decent analysis of where he is going to come out. With the kind of systems we have today, this is where we are. We have some tremendously expensive, powerful toys that we are fooling with. Engineers have never had anything with such intellectual power as these to work with.

I think we need things like simulation. If this group wanted to do something great for this industry, it might formulate a simulation group rather than trading off programs because I don't think you will get anywhere with such activities.

Instead of working on the specifics of these programs and being able to have an industry wide program, maybe you can work up a method of system simulation where we can plug in a 505 or a 1010 or a phototronic CRT or 1200 or other machines you can buy around the world with their characteristics together with theis subjective aspects (and those are the ones that will kill you because there is no number that represents them).

Maybe this is the way of making a positive contribution for the next decade of fun that we are going to have with these systems, if any of us are to survive.

WIGINGTON

I'm glad someone has laid to rest the flexibility of software. I have been in a situation where I would rather move a wire than change a program!

The main point I wanted to talk about was the proper role of hardware improvements. As I identified in my previous remarks, I think some of the most important technological technique problems were software problems. That does not mean that there isn't a role for improved hardware. Always when one can get more bang per buck, there are opportunities that arise so that greater capability can be traded off to help save in other areas which may in fact be the major cost.

Some of the places where mini-computers are beginning to show their muscle, and they do this is some areas and not in others, are cases in which the more computation per dollar has been able to be exploited in a systems context. As an analogy, I can recall from some of the design trade-off history with respect to electronic circuity to illustrate this. Not many years ago the principle of design optimization for logical circuity was minimizing the number of relay contacts in the circuit. And this was carried over into vacuum tube days in which one minimized the number of amplifying elements.

The initial days of solid state circuity followed the same pattern, but changes in ways of constructing things, supplying power and building things, have corrected the situation now that one no longer tries to minimize the amplifying element. That is the cheapest element in the entire system. Rather, he trys to so arrange things geometrically so that he minimizes the number of interconnecting wires, which once were the cheapest elements in the system.

The point here is that just because today's problems are in the technology of software - or, in the larger context, system engineering and design -, I think there are opportunities wherever greater capability for less cost can be presented and then traded off to help some of these other areas.

DUNCAN

Anytime anybody raises the use of a mini-computer in connection with typesetting, somebody introduces hyphenation.

The main problem of hyphenation is that you have to have it good enough so that it avoids amusing the reader at the expense of the learned publisher. This is a software problem, but since this is a hardware session, what I am going to talk about is hardware because I have been trying to get hyphenation over the hardware problem. For example, I would like to know how much core, disk space and everything else a 99% hyphenation routine consumes.

Let me make an analogy. We used to buy big numbers of crunchers to do ridiculous little things like inverting matrixes and highly repetitive calculations. Now you can buy something called an array processor; you hang that on the outside of the machine and it looks like an input-output device. So if you are still wanting to do a matrix inversion, then you buy an array processor and that saves you costly big computer time.

It suddenly dawned on me that a mini-computer is not designed to do 99% hyphenation; it does some simple kind of a 40% or 90% hyphenation program. This is where the mini-computer comes in. If you want 90% hyphenation, why doesn't somebody who understands this

business get himself a mini-computer with a disk or drum and a 90% hyphenation program. Now we can identify 99% hyphenation with hardware and with cost. We have this program that gives us 99% hyphenation. So you give it anything up to antidisestablishmentarism and, wham, back it comes hyphenated.

I suggest that hyphenation is also a hardware problem, not just a software problem.

DOLBY

As a patent holder of a hyphenation machine, let me hereby endorse the previous speaker's comments. Actually, I know of three patents that provide hyphenation capability in various qualities and I have heard rumors of others that are wired in. I don't know that they are protected by patent or whether they infringe on the existing ones or both, but it is quite clear that this is one quite simple problem and, in Ray Lannon's report, there is a cost breakdown of what is roughly known as the Air Force Linotron that has not only hardwired hyphenation but hardwired lots of other things where the operating costs for the computer time is very small. This thing exists; I presume Mergenthaler is willing to sell it, but I don't see anybody rushing to buy it. I don't understand the marketing situation that makes for this.

BUCKLAND

As long as we are discussing hyphenation, I can say that problems of this type point out additional advantages of time-sharing. We simply store a certain number of words in the computer and when that is exceeded, it asks the operator - and it always will ask the operator because you run into foreign languages, cyrillic alphabets, all the rest. If you can afford to sit and fill out million word dictionaries - fine; but it is simpler to ask the operator. But you cannot ask the operator if you are tying up a big machine for $600 an hour which is the case unless you are time-shared.

SHATZKIN

In interests of continuing the controversy, I would just like to enter a plea for function here rather than tradition. It happens that geese fly in V formation, not because of tradition but because it helps them fly and requires less energy. When monks ended a line and ended it on whatever letter they had to start the next one, they did it not because of tradition which they were starting in the hope of confounding us and creating problems, but because they were writing on parchment which was expensive. And they weren't about to spend a lot of money on extra parchment for producing something which didn't have to be read very fast.

We live in a different kind of situation in which the

speed of reading is far more important than the amount of paper being used. If you do without hyphenation, it happens that you gain per page. But even if you didn't, we are concerned with the speed of reading.

Consider the functional standpoint. I have heard people here talk about hyphenation; I have yet to hear anybody explain what the advantages of hyphenation are. Is it simply because the customer wants it? That is not a bad reason, but let's say that is the reason if it is. If there are advantages, I think it behooves us to say what they are. If something doesn't have a function, and in fact interferes with reading rather seriously, impartial experts should be saying so.

Another thing I would like to come back to. Mr. Taymans pointed out that he has a method for connecting the keyboarding before it enters the computer system. Mr. Kolb pointed out that the CRT machine doesn't make mistakes if the input is correct. There is a rather important economic consideration here. If it is true that you can be sure you have the page correct in the first place so that you don't enter it into the system until it is correct and if the machine is not going to make a mistake, the principal reason for reading proof is done away with. There is no point in seeing proof to check the computer any more than there is in using a paper and pencil to check the arthimetic that the computer does when you are using it for calculations.

To give you an example of what this means, for a company like McGraw Hill, the cost of proof, that is getting it, checking it and paying for corrections, represents one million dollars a year or 16% of composition costs in addition to the amount of time that is wasted. It seems to me that we would gain a great deal by avoiding the need altogether by putting in clean data rather than finding ways to manipulate the stuff after it is in there and find reasons to correct it on CRT displays or some other way. The editor probably is not going to bother with the CRT anyway. He is going to tell somebody else what corrections he wants and they are going to sit in front of the cathode ray screen, a further cost factor. We should avoid that need altogether by checking input, having faith in the computer system and making decisions knowing that the system is not going to confound us by introducing errors. This approach would save a lot of money, time and headaches.

BUCKLAND

We have made all kinds of analyses of systems of this type. We even designed a system which involved triple keyboarding using majority logic but when it came right down to it, someone always changes his mind with the copy. You get it exactly right and the reviewer wants to change it one more time.

SHATZKIN
Don't get it to him and he won't change his mind. You give it to him because you don't believe it is right and he checks it and in the course of checking it, he finds that he can word it better than he did the last time and this goes back and forth and if you showed it to him four times, he would correct it four times. But if you have the courage of the belief that you can have a system that doesn't have errors in it and you can assure him that there will be no errors, he would be very glad not to check it. My problem with no proof now is the compositor, not the author or editor. I represent several publishers who are very willing not to see any proof at all, but the compositor is afraid to take the responsibility for getting the stuff correct. He wants them to see the proof and change the copy so that he won't be responsible for being right.

HENDERSON
We in the service business like Publicate must recognize that our customer, the publishers, have established habits which they follow in producing their publications and we cannot expect to change these habits overnight. Two of our customers are producing abstract and index publications; one of these publishers has been using an automated system for more than four years. In the first three years, his publication was phototypeset on a second generation electro-mechanical phototypesetter. This machine introduced mechanical errors into the text and, therefore, it was necessary for the publisher to thoroughly re-proofread camera-ready copy.

We have been phototypesetting this 500-page publication for ten menths now and the publisher still completely reproofs camera-ready copy. He finds no errors which were not previously indicated on computer proof list. This re-reading delays his publication three to four days.

We have another customer who began a new publication in January of this year. He has learned after proofreading for the first couple of months that no mechanical errors are introduced from the computer proof list to camera-ready copy and that the typeset material will conform to his specifications. He does not reproof read camera-ready copy.

SHATZKIN
If you are the compositor, you are the victim of your customer. You have to give your customer what he wants. I can't quarrel with that. I am quarreling with the attitude. If the customer wants to see fourteen proofs, you have to give him fourteen proofs and he has to pay for them. But we are not discussing simply the problem of supplying somebody something he wants even though it is bad for him.

If we were druggists and we were to supply very bad drugs on demand to our customers because it made us money, we would at least privately acknowledge that it was bad.

Now what happens to this fellow who makes these corrections. You can't talk him out of it. But you take a look at his proof reading and you will find that the final output is not perfect in spite of the fact that he has read it. Our experience shows that there is no McGraw Hill book published which on proof has been read by three or four people that doesn't have errors and sometimes very serious errors.

Most of your customers are not getting perfection now but they are insisting on perfection in a system that would substitute for the one they are using. You can demonstrate very easily if you try (I have demonstrated it) that the result that they might expect without seeing proof is going to be very close to the result they will get without seeing proof but they will be able to produce the book in a fraction of the time and at a very substantial reducti n in cost. I think it is our obligation to do that educational job. We should not be concerned only about selling. We are talking about principles.

I want to come back to the question of hyphens. Is there anyone who would imply the more hyphens the better? What are the standards of hyphenation? Does it make it easier to read, or just what does it do that is so good about it?

DeWITT

In the matter of hyphenation, hyphens were invented because the inventor thought they were the lesser of two evils. The two evils are: wide word space actually up to an inch and hyphens. And hyphens, if used with discretion and not too frequently, are the lesser of two evils.

JOHN SEYBOLD

There are two fundamental concepts that are emerging here and I don't think we want to lose sight of these concepts. One is the Shatzkin theory: get it right first, and set it second. But to do it you have to know what you want. You have to visualize at the beginning what the end product will be. There is a lot of education and a lot of communication which has to be carried out here.

The diametric opposite is to say that there is an intricate evolving document going back and forth between the compositor and the publisher and the author. You could make a beautiful diagram with all these relationships. You can say, this is not bad. This is what we really want. But it should be instantaneous. In other words, the purpose of the system would be to maximize communication rather than to say there shall be no communication. This is the interactive system. This is a bold concept. We will be talking about it tomorrow in software development. We have to go both ways. I would not want to settle for the situation where you only can get it right in the first instance. I

would want an alternative to this, where the author can make a last-minute change today and his book will come out tomorrow. If this involves repagination, we will repaginate by computer. We want to keep track of these two alternatives and have both possibilities in mind.

We've talked very constructively this afternoon about the hardware-software interface and we've begun to grapple with the real problem. I would suggest that the first solution is best suited to the mini-computer. That is to say, you get it right and you set it and it goes fast. The second solution is the time-sharing solution, the big computer one. We can follow both solutions because we can plug our mini-computer into the big computer and get all the power and the sophistication of the big system. I submit that it is the function of this group not to define the problem in niggard terms. We should still have a big, broad, bold concept even if we can't choose now. Because some day, we will.

BLUM

I would like to discuss hardware. Some of you have complained that we haven't discussed hardware and come to grips with the problems. There are six companies represented at this workshop who have expended a rather large amount of money to develop hardware for photocomposition. They spent a lot of money in terms of market research and product planning trying to determine what it is the users really need. If you will look at Composition Information Services' charts, you will find that you have selections that are rather astounding from Compugraphic's small machines up to the big modern CRT. I have yet to hear any of you say that you don't have an adequate selection of output devices.

HARMON

I don't think that Sam Blum included Information International in the total of the six companies that have produced hardware. But when a company spends in research and development as much money as it has made over a period of twelve years, that's an investment in the photocomposition field. The results of that investment is a device that will be shown in January which has total input capability. I'm talking about taking any image, any text on microfilm as an input and scanning that on a 16,000 by 16,000 matrix and preparing that for processing. The other device is a device which handles Ron Wigington's total problem, that is the FR-80. There is one problem when you use microfilm and that is the making of the plates from the microfilm afterwards. However, I also know if there were enough people who wanted a microfilm plate maker and if they would prevail upon certain companies to pull out of their back room what they really have, you would have the plates available. A recent market survey shows that there is no significant present market for a microfilm for making plates for photocomposition.

JONATHAN SEYBOLD

I do not want to leave Shatzkin hanging so I want to bring the hyphenation thing up one more time. We did run some tests where we took a body of text and ran it hyphenated and justified and then ran it ragged right margin. We got more copy per page running ragged with no hyphenation. This was because we allowed ourselves a longer maximum line length. We found that the eye "sees" the average line length on a ragged right page, not the longest line on the page. In typical justified copy very few lines are set to the full measure without space band expansion. Therefore, ragged copy can be set to a longer maximum measure to get more material on a page without looking as if it is taking up any more room.

ANDERSSON

Getting back to that hardware comment, there are inexpensive Compugraphic typesetters that have a hyphenation system which is just a few circuits, really. And I would like to ask Len Shatzkin why he wants to take hyphenation away, even though I kind of agree with him. He says: Why have it? I say: What do you gain by taking it away? You gain a little legibility but the copy doesn't look as neat. I concede this. But what else do you gain if you can get a hardware glinch that hyphenates for a few thousand dollars.

SHATZKIN

An important criterion is the gain of legibility and compactness with legibility being the more important. I think this is important in choosing the right typeface, the right line length or the right leading.

It seems clear to me that hyphenation is unnecessary and interferes with legibility and compactness. It is too bad that so much money for perpetuating something because we think the customer wants it has been spent. A lot of you have spent money duplicating each others' efforts to produce hyphenation programs. Now you have to have a lot of larger computer facility to continue to provide it. It is too bad. I regard it not simply a matter of cost but as an evil because it slows up reading. It means more pages per book and that is worth a lot of money if you're producing a lot of books.

Tied in with hyphenation is justification which is a lesser evil but certainly no advantage. You can't tell me that changing the spacing between words on every line helps legibility. And if you will keep this in mind and look at the next set of justified lines you look at you will be aware that you are slowed up by the fact that the space between words on one line is different from the space between words on another line. Subtly, it is not as bad as trying to put the two parts of a word together if it is hyphenated and you read mac-hinery and realize that it is not mac-hinery after all. Justification is not that

bad, but it is an evil. I don't see why we should perpetuate something that is even mildly an evil and which is costly to perpetuate.

NEWMARK

I have been waiting for someone to give some reason for justification. Many of us here are interested in producing indexes, catalogues and other comparable material. We are concerned with the format and the blocks for display more than for reading text line after line. We're interested in block position. Some users want many different kinds of typefaces in their photocomposition product. For the same purpose, in order to be able to distinguish data elements, you want to have several different sets of typefaces, types available in a data block. If this is a power we can get in photocomposition that we couldn't get before, this is another reason for going to photocomp and through photocomp, making available as many different typefaces as possible.

DOLBY

I might say to Len Andersson that he is taking one view of a two-sided problem. As John Seybold pointed out, the page composition problem is vertical justification. It also has the comparable thing to a hyphenation rule. We spend a lot of time and money working on it. You cannot hyphenate the middle of an illustration. There are definite rules for ending a page. If we want to go to books of variable page size we can do this very nicely if we want to go to books where we have ragged right and ragged bottoms. My experience with computers overall is that every time we throw out something that has been around, we find out a couple years later why it was there. Putting it back can be very costly. If any of you have tried to get down to your local bank and get hold of a bank statement on the spot, you will find you can't do it anymore. The best I know will provide it in a week. They can't tell you what checks have passed through since your last statement because your check number is not in the system in machine readable form. They left that off so there is no way they can tell you this since the system doesn't know what check numbers passed through. There is no way to recover it. They can't tell you this by definition. It was a system fault from the beginning. Now I don't know if we did without hyphenation the world would come back at us in two years. I don't know if we want the variable length page frames both ways, the world would come back at us. But I say - watch out!

LARSON

'Index Medicus' which was the first publication produced on a high speed photocomposition device that was driven by computer is a non-hyphenated publication. This is primarily because in 1962 we did not know how to write hyphenation programs. In any event we computed the impact on pagination caused by non-hyphenation and found it to be +3%. That is to say we increased the number of pages per issue by 3% for an 800 page volume printed 12 times per year with a press run of 6000 copies. Non-hyphenated cost us, therefore,

1,728,000 extra printed pages per year. I should point out that "Index Medicus" is composed in three columns and uses a lexicon with a high incidence of multi-syllable words. Accordingly, our experience with hyphenation may not be of application to someone else.

SHATZKIN

This is another subject but it follows from what Ray Lannon just said. What we are coming to, I think, is the realization that we are talking about not one system but rather a whole series of different systems aimed at different markets. If hyphenation leads to tighter spacing, you may want a system that permits hyphenation. If hyphenation adds space in books, at least some publishers of books should have available to them a system which costs less to operate because it doesn't supply hyphenation and which makes their books shorter and saves them money on paper, press work and binding as well.

We have a whole series of different problems. That is another argument against a general system in favor of a whole series of subsystems for handling composition aimed at the particular needs of each user. I say that non-hyphenation may apply to books. I question very seriously whether the New York Times wishes to run eight columns ragged right. That would look very bad. But in single column book composition, it is the coming thing. There are books produced this way, and people aren't even aware of it. That's how indispensable justification now is.

It seems to me we need to analyze our problems by classification. We need to have a series of solutions for different classifications of problems instead of trying to find a universal solution. I agree with John Seybold that there are certain places where you want to have instantaneous reaction systems. I would think a newspaper is an ideal place where you interact with the system right up until you go to press. That system is not needed where you are dealing essentially with dead manuscript which is the case in 99% of all published books, where you don't have to interact instantaneously. So we should have a whole series of different solutions for a whole series of different problems.

FAULKNER

The discussion for the last hour or two about hyphenation leaves us completely unproductive. Gentlemen, we have the capabilities today in many of the systems that are available to say 'Hyphenation - yes or no'. As you do is put in a character parameter, so what are we beating a dead horse for?

SHATZKIN

The question is not "could we" but "should we".

BUCKLAND

I would like to ask a hardware question myself. Our costs for computer processing in support of composition versus the cost of the composing machine itself are about one to one, which is different from most of the experience cited here. We use time-sharing so that we don't pay for a lot of input and output, but also we have persuaded a few customers to buy CRT proof. In fact, we do no upper and lower case line printing proof anymore. We find that once they get over the initial cost jolt, which is two or three times the line printer costs, they like it editorially. What I would like to know is, how does one use these CRT machines in a high production proof mode so that I can run proof as much as I want at a far lower cost than I am paying now?

JONATHAN SEYBOLD

This is possible with many of the machines. Take the Harris machine that you are using. There is no reason why we would not take a five point master character and set it in a larger point size for proofreading purposes. There is no reason you have to go through a full photocomposition program before going out. You can use a simple out program which takes the file and writes it out in a format that drives a CRT.

BUCKLAND

It seems to me that microfilm is what you need. You seem to be using a type setter like a COM device which is set up for high volume print out.

JOHN SEYBOLD

Since we put in a Fototronic CRT at ROCAPPI a year and a half ago, all of the proofing has been done in this fashion, that is, by the CRT, with the exception of certain structured data files, and even with these by and large. I think we haven't been creative enough in realizing that it is possible to play certain tricks, like larger point sizes, to ease the responsibility of the proof reader, to make a format somewhat different, to call attention to a particular portion, to set words in bold or to put in blotches of black material when you want to call attention to it, to call attention to the presence or absence of certain codes. It is very easy to do these things. It seems to me that wherever you have idle time on the CRT, it is tragic not to do this, and you only use a negligible amount more computer time.

BUCKLAND

The format design for easy proofreading or to aid the proof reader has lots of white space on it. Two things happen: the CRT machines are slowed down and you run up a tremendous paper bill, so I think you've got to go to microfilm with some kind of blowback device.

HARMON

The one problem that you have in using microfilm is that you have to wait some time before it can be developed, and so on. If you don't mind the wait of an hour before you start checking, the use of microfilm in a microfilm reader is an inexpensive way of doing it. The printer will allow you to read the output directly

ANDERSSON

We may be forgetting one thing. If people are so used to seeing hyphenation and justification so that you can sell more books by doing it, then you ought to do it. If one author's alteration makes the difference between a best seller and a mediocre book, you had better be sure to catch that one author's alteration. We're preparing something here that somebody is going to read and the ultimate consumer is the reader and, hopefully, the buyer. Anything that we are doing in manufacturing, typesetting, printing, what have you, that takes away from the ability to market the end product is a poor choice and a poor system. What we are really doing is trying to sell more printed material one way or another.

Panel 3
Software and Systems

STRAUSS

Summarizing yesterday's session, it is my personal impression that those who expected a clear picture of the state-of-the-art of the industry must be disappointed. Probably they would be disappointed under any conditions because in meetings like the present one you can't get such a picture. Looking realistically at our meeting, I might point out that many participants are here because they are supposed to bring back information to the organizations who sent them rather than to give out certain information which is still controlled by management policies. These are the facts of corporate life and they might as well be expressed by someone who is not under company discipline.

If this meeting has not given us a picture of the state-of-the-art, it has certainly given us a picture of the state-of-the-mind of the industry. We heard plenty of divergent opinions; we witnessed a flying off in many directions, all of which made some of us believe that we have a problem of communications within our own group. I will try to identify some of these problems and to illustrate them with a few examples.

Two different meanings of quality

Yesterday a large portion of our time was consumed by a discussion of hyphenation in the sense of word division at the end of a line. (That hyphenation refers also to compounding of words and that this kind of hyphenation can complicate end-of-line decisions considerably was not even mentioned.) But I do not intend to talk about hyphenation itself; I want to point out that hyphenation is judged in terms of quality and that our problem is lack of agreement on the meaning in which we use the word quality. Here as elsewhere quality has two conflicting meanings: (1) quality is used evaluatively, almost as a synonym of excellence and (2) quality is used as a summary of identifiable properties. Those who speak of quality in the first sense use the word in its singular and modify it by terms such as good or bad. Those who speak of quality in the second, descriptive sense have more or less precisely defined quality levels in mind. It would be helpful if everybody using quality in our discussions made clear which of these two kinds he means.

Recently two different quality levels have often been opposed to each other in discussions of composition. One kind is usually labeled as graphic-arts quality and the other as utility composition. If I may characterize the latter kind of composition in my own terms, since we are lacking a generally accepted precise terminology, utility composition means to me composition of a minimum barely admissible quality level. To me this means that this kind of composition, or typesetting, should be done with the least possible, the minimum effort which still conveys the intellectual content of a page (book, magazine, or what-

have-you) in such a form that the reader will be able to absorb this text. I feel almost sure that those who advocate minimum admissible quality are prepared to hear that this concept puts them outside the whole graphic-arts tradition, and that they may consider this consequence almost desirable, befitting their low opinion of the printing industry. Permit me to add that this concept puts them also outside many other accepted cultural values of our whole civilization.

Is minimum admissible quality enough?

You may compare this functional concept of minimum admissible quality in composition with appearance in many other fields -- in dress, in styles of furniture, in architecture, and so on. It is a fact that the barest minimum suitable for a given purpose is simply not good enough in many instances. We must learn to find out what traditional elements are expendable and which are not, and this is a far from simple task.

Let me illustrate with an example that functional economy alone does not always carry the day. You may remember that during World War II it was decided that men's trousers should have no cuffs. And you all remember that cuffs came back even though neither I nor anybody else may know what cuffs are good for. I do not know whether they help geese fly or fish swim, as advocates of minimum admissible quality have pointed out defending functions in the animal kingdom, but I do know that most men wear trousers with cuffs. I invite you to a simple test -- just look at your own and those of other participants.

Printing is subject to the taste of its environment

You can't take printing out of the context of the whole civilization and say: 'I want to chop printing down to the least expensive minimum, and that will be the best because it is cheapest and still does not impede communication.' And you cannot be so sure that this functional minimum really does not impede communications. These things are far from easy to find out and still more difficult to prove with certainty.

This could be the proper point for explaining how my present talk is related to the theme of our session. The reason why I am on this program isn't that I am an expert on software -- which I am not. I am here to discuss some basic facts which must be understood before you can begin to decide on software. Another reason for my presence could be that I am never losing sight of a simple idea: the whole is often more than the sum of its parts.

Let me illustrate what I mean with a true story, told to me by one of my friends. It is about an offset duplicator developed by a large equipment firm. As behooves such a company, a most detailed, minute set of specifications was prepared incorporating the demands of all interested departments. In due course a prototype was built and

finally the day came when the new press was demonstrated to the top brass of the company. The project engineer pressed the button, and the machine worked beautifully. Everything was automatic: the paper was fed automatically, the plates were changed automatically, the blanket was washed automatically, ink and water were controlled automatically, and so were many other things done automatically on this marvel of press design. After many ah's and oh's of admiration one of those present at the unveiling picked up a few prints, looked at them and said: 'But they are lousy! This press does not print well!' The answer of the project leader should be preserved as a classic. He pointed at the pile of specs before him and answered: 'Show me in this whole stack of specifications that anybody asked for a machine which prints well!'

Printing is not a branch of mathematics or logic

When I listened to some of our group I got the feeling that they either never recognized or simply forgot one fact which is for me crucial -- that printing, or the graphic arts industry, or the visual communications industry (no matter what you call it, it is still the same) is not a branch of mathematics or logic, but a branch of the visual arts, and even if you play the word 'arts' down to its lowest industrial meaning, printing is still something visual. It is something that people judge by looking at and not by measuring and calculating. If you want to succeed as systems designers in printing you must understand that you are dealing with an industry comprising about a million of non-mathematical people. The personality and character structure of their overwhelming majority is the result of an unconscious selective process. Little as we may know about this process, one thing is for sure: visual response is a common denominator which ties all printing, all graphic arts, all visual communication people together.

Printing practice supplies the evidence for this opinion. This evidence is the decisive role of the proof in printing communications. When we communicate in words only we often misunderstand each other but with the proof the moment of truth has arrived. Now communication becomes specific, concrete and unmistakable. The visual has all but replaced the verbal medium. The visual dominates -- the verbal merely supplements.

In the more recent past an entirely different kind of people has entered the industry: computer technicians and systems designers. Their education and background, their personality structure differ widely from that characteristic for printing. They are neither literary nor visually oriented but are numbers people. Their natural propensity is for mathematics and logic but not for shapes and colors.

Suddenly this small group of advanced technologists says: We want to take the visual out of printing. We want to take the visual out of the visual communications industry.

We want to bring printing down to such facts as can be measured and calculated. We want mathematics and logic to supersede the visual.

Can anybody be surprised that communications between these two groups, the avantgarde of technology, and the bulk of the visual industry are strained at best and impossible at the worst?

From Albrecht Duerer to Tolbert Lanston

Fortunately for all of us printing has a long though much too little known history of science as well as art as I will show by a few glimpses. This history began, if a date must be mentioned, in 1525 when Albrecht Duerer, one of the greatest artists ever, published his treatise on mensuration (Unterweisung der Messung etc.) in which he showed how to put letter design on a scientific, geometrical, basis. Another milestone is the publication of Mechanick exercises on the whole art of printing, 1683/4, by Joseph Moxon, who was, to my knowledge, the first to put in print that 'a typographer ought to be a man of sciences' and that typography is 'also a mathematical science.' (See: Moxon, op. cit. edited by Herbert Davis and Harry Carter, London, 1958, page 11.) It is worth noting that Moxon wrote 14 years before the great Leibniz addressed his famous letter on the dyadic or binary system to his Sovereign and Duke.

It took approximately 200 years from Moxon to Tolbert Lanston's unit system. But this unit system by far transcends the scope of metallic composition for which it was developed. This unit system, or some variation of it, has become the linchpin of all modern high-speed composition. Unfortunately, I cannot mention even the names of the most important persons to whom we owe the transition from a crude handicraft to a high-precision industry. This process took many stages, involved many nations, and deserves to be treated in all detail.

The educated eye is the supreme judge of composition

Here I must mention one point at least: in each of the many steps by which this transformation was wrought, both science and art were involved. And it must be added, emphatically, that the eye remained the controlling organ in this interplay of numbers and images. The most logical, most mathematical, most technically accomplished result had to pass the complex psychology of viewing. In composition, the educated eye remains the supreme judge, the last court of appeal.

Let me next relate to the visual aspects of composition what I have said about quality. Different eyes are differently educated or, if you prefer, differently prejudiced. Applied to quality this means that there exist, undescribed, unidentified, undefined, unclassified, helter-skelter, at random, many different quality levels of composition side by side, in any imaginable configuration. Until we have learned to classify these levels the desired and required quality

level must be found out case by case, situation by situation. Systems designers, sales personnel, users and buyers of composition must fit available facilities and actual situations.

To be explicit, some situations may require highest quality hyphenation and justification simply because anything less would debase the composed piece in the eyes of the particular audience -- or should I say readience? -- for which it was prepared. Hyphenation and justification, which were called here a sin by one participant, would be a necessity in such cases; but they may well be a waste of effort in others.

The communications hiatus

This could be the right moment for discussing a strongly felt want in industry communications. Our trade press has a tradition of playing up initial successes of new departures and of never reporting on their later failures. Since some achievements are less definitive than their sponsors hope, they may be eliminated from industry practice without informing the public. The result is that the initial reader is left holding the bag.

Or differently said: for success he can rely on the trade press, for failure on the grapevine. Is it asking too much that those who like to cackle when successful should share with us the causes of failure? It may not be practical, but I wish we could award prizes for the best reporting of significant failures. Generally speaking, I am convinced that the industry needs detailed reports, or studies in depth that can guide us in a more rational or factual evaluation of the many claims and suggestions made in this time of new technology.

One speaker said in the last session that changes in the text should be made because even a single change may contribute to making a book a bestseller. I do not believe that one correction, or even the addition of a single particularly apt phrase makes for a bestseller. Again we are in a gray area -- nobody really knows what makes books sell, though many have strongly held personal -- and often controversial -- opinions on this point.

The limits of talksmanship

It was suggested that the proponents of cost-saving, rational manufacturing methods should talk publishers out of wanting traditional but unnecessary quality levels of composition and replace hyphenated lines with ragged right ones. I believe that talking people out of something into something else is possible in some situations, for example in retail selling when an amateur buyer faces a professional salesman, provided the buyer has the final decision. But this sales technique will fail when the customer is a large organization and the buyer is merely one, and often the least important one, of a number of people within the organization who must accept the product or service bought.

Even if you could convince the head of a publishing company, you would still have to overcome the opposition of his editorial and art staff, his sales department and possibly even that of his authors. Few publishers will like to put up with the day-to-day resistance of their whole organization because of changes which are of comparatively small financial benefit, if such benefits can be proved at all.

One of the reasons why changes in composition are slow is that the gamut of those concerned with composition is in its upper limit as wide as the total literate population.

Writers, editors and systems engineers

Being a writer it was only natural fo: me to study the relations of editorial and technical staff. These two groups have a long tradition of ignoring each other. They are afraid of each other because they know so little about each other, and vice versa. So, many of them came to believe that the only form of coexistence is by separation. I have all sympathy for the participant who reported his experience as a systems designer with a publisher whose editorial staff stands with flaming sword ready to defend the holiest of the holy in the English language -- proper word division! I can share the frustrations of a programmer who is faced with editorial 'cats' insisting on one hundred per cent correct hyphenation as 'a way of life.'

In their eyes a systems engineer simply does not count. He does not speak their language; he does not know their values. He is not a literary person; he is ignorant of Proust, and James, and Joyce. In their opinion he is merely a boor, and they lay down the law to him looking down their noses.

Unfortunately for himself the systems man has not the slightest idea that the cats' position is much weaker than it looks, not on his but on their own, on literary grounds. Unfortunately the whole industry has not yet understood that composition needs the writer, the philologist, the grammarian, the person whose main professional interest is in the English language, the anglicist (to use a technical term) just as much as the technologist.

The new composition needs the philologist, the anglicist

Word division is a complex subject. Here I can discuss only one of its facets which I will label arbitrariness. Depending on time and place the same English word may have a different meaning, different spelling and a different way of division. If you do not know this and judge a person's literacy simply by the last, you, a highly educated Englishman, may appear like an American boor and vice versa because either one commits certain solecisms according to the other's rule book. These books are made by writers, publishers and printers. If you want to change them you should begin with those who enjoy the greatest respect with writers and editors, the philologists, the anglicists. Once you reach agreement with them you will be able to throw their

prestige on the scales in your battles with editorial staff, and willy nilly these will have to listen because their own ideas of authority will force them to do so.

Instead of ignoring them, I repeat, you must bring in the grammarians, the philologists, the anglicists, the teachers of our writers and editors. And the same is true with designers and illustrators. They too have a stake in the printed page, and their cooperation can make your job as systems designer, as programmer easier just as their non-cooperation, due to lack of information rather than bad intentions, can throw big blocks in your way. Now, it was suggested here that books should be standardized because standardization would help to economize. Now a designer can handle, as it was said, 20 books per year. Standardization would permit making 400 books per design and reduce design costs correspondingly.

I must again remind you that generalizing can be misleading. There are situations in which standardization would be of great benefit and there are others when it would not. Seen sociologically, mass production is a continuous struggle between the principle of standardization and that of individualization or personalization, just as people want to have the benefits of standardization without losing their own identity or personality in the process. The general trend of this struggle can perhaps best be illustrated by comparing Henry Ford's famous dictum that the customer can have his automobile any color he wants, as long as it's black with the diversified colorful product line of Ford anno 1970.

As an afterthought, please do not expect the designers whom you wish to add to the ranks of the unemployed, to love this concept. Masochism is, as we have learned, a great psychological drive. Fortunately it stops somewhat short of self-immolation with the great majority of human beings.

Is a new alignment possible in book publishing?

If I may change the subject I should like to digress for a few minutes on the different functions of publishers. By and large, publishers have three main groups of functions: (1) development of books and recognition of merits in submitted manuscripts or ideas, (2) editing, designing and supervising the production of the finished product, and (3) distribution of books including advertising, warehousing and all related operations. Not all publishers are equally interested in all three areas.

The new composition technology may offer certain opportunities to those who want to concentrate on book development and production without having the machinery for distribution. It is conceivable that such publishers will bring a book to the point where composition and illustration are completed, and everything is ready for platemaking, press work and binding.

The creative, or developing publisher would then offer a complete package to the distributing publisher. This package would contain a dummy of the designed book, cover and jacket, page proofs and a set of photomechanical intermediates, negatives or positives, as the case may demand. The distributing publisher would decide on the size of the edition and control press work, binding and all following steps. The advantage of this kind of division of labor would be that the entrepreneurial functions could be reorganized, by newcomers, around the new technology, with new people, free from traditions and eager to try different ways. The editorial staff of publishers, which is today the biggest roadblock, would be bypassed in these cases and the sales department of distributing publishers would be in a decision-making position. Whether such a plan could work and what its consequences would be remains to be seen.

Finally, I should like to express my concern about the polarization of the working process which is so characteristic of all computer controlled and directed technology. The work of the skilled craftsman is now divided between two groups of people standing at opposite poles of the educational scale and joined in the working process by their dependence on the computer and related equipment. This polarization of skills may be our fated lot. It is also to some extent responsible for the polarization of society. Be that as it may, recent experience has shown that it is rather easy to under-estimate the difficulties attending the new technology and to dissipate the resources of a company in the learning process. Not everything is wrong at present merely because it has worked in the past even though it may become outmoded in the future.

JOHN SEYBOLD

I hate to follow Mr. Strauss because what he has to say deserves consideration without my turning your thoughts elsewhere. I hope we will have a chance to return to some of the philosophic problems that he has raised, which are extremely profound, as Victor always is. I am going to try to talk quite specifically about the software problem. Before doing so, however, I want to make one unrelated comment. Ray Lannon is with us and you know, of course, of his study, which has been cited many times. I wonder if you know of his bibliography, which is a very important contribution to the literature. Although it is very comprehensive, it does not have as much about software as it should. It is mostly the gee-whiz kind of literature, because that is what there is. But perhaps some day we will be able to add to that bibliography some substantial contribution in the software field. (Editor's note: This bibliography was distributed to the workshop participants and is cited in the bibliography of this publication.)

I want to discuss what is wrong with software as it relates to computer composition. There has been some financing by public money going into the software field.

It has been, I think, almost entirely special purpose software. The money which has gone to the mathematics, physics and chemistry people has not been for the purpose of devising a general software package. And even the money that has been spent in the Government Printing Office really was not for the purpose of developing the kind of software package that most of us are involved in using. It was to handle a certain prescribed number of formats in the field of government publications.

Well, what has happened in the software field? For the most part, individual people on a proprietary basis have tried to develop certain software systems. Many started rather late in the game because, as I have made the comment before, they waited for IBM, and IBM did not rise to this situation. IBM did, along with others, develop some software packages for some specific pieces of equipment, but I think most of us felt this was too big a job for us and IBM would certainly do it and IBM is still in the process of putting it together. Obviously they could have done it if it had seemed important enough to them, but with all the various avenues to pursue, it was not obviously a high priority item. You don't see that many computers for this particular application.

But time was lost while we waited for IBM to do something. RCA stepped in and I think it is too commonly the impression now that there is nothing but the RCA PAGE 1. But it is certainly true that the overwhelming number of third generation users are linked in to that particular philosophy, the PAGE-1, PICA, HCL approach to software. Basically, these programs were written by non-typesetting people. They are awkward to use; they are cumbersome. People have found ways to make them more effective. They are powerful programs if they are used properly. As Howard Tompkins said, they don't underwhelm, they don't even whelm. They overwhelm. But to have to say (PF1; PF8;BL10) which was the initial conception of the input stream to define a single given typeface is cumbersome. Now it is possible to go on to a general format statement and to store these format statements and to improvise better solutions. But there should be some alternative approaches. We need to look at some of the other solutions.

There should be a contest of ideas in the field. And the trouble has been that people picked up these software packages because in a sense they were free. Or, if they cost money, they cost $40,000 and not two million dollars. This is something that one could afford and one felt, I will build on these; I will have this as the starting point. But the sad truth is that you can't build on somebody else's program. You've got to be able to get inside the program; you've got to be able to understand it; you've got to be able to reassemble it or it is not your program. I think there are ways of doing this, but I think the best way is total involvement in their creation. But I don't think we are going to get anywhere with proprietary software packages

for third generation typesetting machines. They are fine for second generation limited purpose application.

Now basically I think the problem with the compiler type of program is the problem of the conditional statement. This is where it gets hard going. This isn't really related to hyphenation and justification. This is related to page makeup. And you define the bottom boundaries and you say this is the way we proceed but under these circumstances, we do this if this occurs. When you encounter this, here is what you do, and so on. The alternate course is to let all of these factors be injected by the computer program rather than by what we now call the programmer. We have two kinds of programmers. We have the programmer who wrote the program and we have the programmer who uses the program. Instead of having markup people, we have programmers. That means a lot of money for a markup man. But looking at the shortcomings, I would say, at least from my standpoint, one of the major feelings of the present kind of system lies in the correction procedures which are sometimes erroneously called editing procedures. There are several general areas of weakness in most programs. I will describe a few.

One is that the material is not readily reprocessible. You have to go back to the beginning. You have to go back to the input again. A good software system should give you reprocessibility at every stage of the game, no matter what stage you are in, hyphenation, justification, pagination or whatever. You shouldn't have to go back to step one again; you ought to be able to pick it up at that stage and make changes at that point of time.

The second problem is that these programs do not have partial processibility. When you go back, you go back and do the whole thing over again. If you want to change a paragraph, you must rehyphenate, rejustify and repaginate a whole book. You may not believe this, but I have seen this in operation. And I have not seen a ratio of one or two times computer time to CRT time; more typical is a ratio of 20 hours of computer time to one hour of CRT time. This unfavorable ratio is not built into the system but it is there because it isn't done right the first time. And then it has to be done over and over and from the beginning each time.

Another weakness in the present software is that it doesn't generally provide any linkage for data processing purposes. There is no reason why there shouldn't be complete and total interaction of all stages between data processing and composition. It is not that hard a job to do. But it has to be built into the system initially. So what you do is write pre-processors and post-processors. Of course you can't change the basic programs because you don't understand them anyway. So the easiest thing is to massage the data at the beginning or massage the data at the end. To get into the program and link it properly, you would have to have the ability to move freely and easily from a data

processing application to a typesetting application back and forth.

I think we have come to appreciate the need for modularity. But on the whole the programs are not modular enough. They may be modular in the sense that you can put in a new pre-processing thing or a post-processing output kind of pass. But the basic program itself, let us say hyphenation and justification or pagination, should consist of a series of replaceable modules. You can plug one in; plug another in when you get a better routine. Take some out if you don't need them. If you need a smaller computer, pull out the modules that aren't that vital to you. A good software system should be based upon what is sometimes called macros. In a book I am writing now, I have given up the concept of "macro." I call them global statements, because the technical programmer types tell me that the "macro" is really something else. All it is is a simple little flag and this is the best of all worlds because in this Alice-in-Wonderland world, they can mean what we choose them to mean. They can mean one thing today and another thing tomorrow. This is the tremendous, if not the single most important, fact about this technology: its capability of redefinition and expansion. You can use codes that stand for other codes; codes that substitute for other codes; instructions that substitute for other instructions. This is the thing that we need to build into the system, and yet these codes never have to be in the input stream in any specific way. They never have to be in the file. They are on your disc and you pull them out when you want them.

For the most part, software programs evolved on the basis of an operating condition where a computer operator loaded a deck of cards in order to run a program. In other words, they did not evolve in an operating system environment. And when an operating system was developed, it was a unique operating system. It wasn't an operating system which permitted you to process anything else at the same time. We have been trying to develop software programs, software systems which do work within a framework of a total operating system. We have been trying to use the power of the operating system, which we should, instead of putting things in specific coding when the operating system can do it better for us. This is a very sophisticated and difficult area -- to determine how much operating system overhead you can afford. But on the whole we're still at the level of thinking we have a great triumph if we can run the program under the DOS. We haven't got to the obvious point, which is that we ought to be able to run it under not only a multi-programming situation but a time-sharing situation, with totally re-entrant programs. And that is the burden of my paper. There is no operating re-entrant system. I am told that the Los Angeles Times hyphenation and justification program is written to be re-entrant. It's not being operated that way. The system at the moment doesn't support it.

Now as you know, when you have re-entrant programming, you have to keep track of everything. You can't set a switch and then wait and say "Until Further Notice I'm in Italics". Because if you're in a time-sharing situation, you're going to be off and back on again and the system has to remember that the last time I was in, I was in Italics; I am still in Italics. So the coding functions are somewhat different.

Basically we're going to go in two directions. We've talked a little bit about this already: the mini-computer route and the maxi-computer route, although it is not that big a maxi (medium scale and up, let us say). Now the burden of my paper has to do with the large scale computer route. The reason I am concerned about this is because the mini-computer thing will solve itself. Not that the software is easy, but that the hardware is cheap. You can do more by hardware and you can afford to put more into software if you go the mini-computer route. But if you go the big system route, we're talking about a big investment. The investment is not just in the program preparation. It is also in the debugging of the programming because if you are going to debug a system which is re-entrant on a time-sharing basis, you're going to bomb many times; this affects the whole system; if it's a big system, it's expensive.

I don't see that there is anybody who is willing to put the money into the development of this kind of program. This is the conclusion that I have come to. I wish it were otherwise. Now we know that RCA, and I thought this was a secret but we have been told by Mr. Schubert that they are going the mini-route; they are throwing away the bigger computers and are using a mini-computer built into the VideoComp. I think RCA is betting this is the way to go and I don't think RCA is, therefore, going to develop a big system. I don't think IBM sees enough market for it. I don't think Harris is going to develop it, but I may be wrong. At the Research and Engineering Council meeting, Mergenthaler announced their plans for a large system and it sounded great to me, but I doubt if they've made very much progress yet. I am not sure that it is a profitable enterprise to do this under a proprietary situation.

Now, for the most part, with these systems, you don't need a big computer of your own. We have written a hyphen-ation and justification program which runs in five minutes on an IBM 360/65 what it took us four and one-half hours to run on an RCA301. Under those circumstances, you don't need your own computer. We're talking here primarily about the technical societies, the government and educational institutions. Most of these organizations have their own computers, or have them available, but they are used for a lot of other purposes. We ought to be concerned about providing a capability to people like this who have access to computers to use creative, intelligent and useful software.

Those who sell proprietary software are going to object to this because they want to make money out of the business, but I don't think the money is in the uniqueness of the software. I think the money is in the ability to apply software. It's always going to be a creative function.

I recognize that what I have said is contradictory. On one hand, I have said that the existing programs aren't good for one reason and that is that you can't get inside them - they are a black box to you because they were supplied by someone else. And then I am ending up by saying let's build a new black box. Except that I propose that this black box be built as an open box with glass around it and that we all get inside. But it is still going to be difficult to use and I think the money is in the interpretation, imagination and application, and so on.

I would like to make a few other minor points. We talked about hyphenation - the big thing is not what is wrong with hyphenation, it is that we cannot live with a line-by-line hyphenation decision. A good compositor doesn't set a line, he sets a paragraph. If he has to, he resets the line; he moves a word up, down or back, or something like this. You cannot solve the problem with good quality composition on a line-for-line basis. You can cheat by letter spacing and things like this, but it's not a big deal to write a multi-line hyphenation program. I don't know if anybody has written one but I assure you it is not difficult. (Editor's Note: Mr. Henderson said he has such a program.)

I am convinced that if the system is big enough, hyphenation solves itself. It is quicker to go out to a disk to find the word with preferred hyphenation points on it than, in my opinion, to go through an elaborate logic routine. And while you are looking to find the word in a dictionary, with preferred hyphenation points, you might as well use the same dictionary to check all the spelling in the input; you might as well use the same dictionary to do syntactic analysis. Why not put in parts of speech, identify the word structure by the significance and the meaning of the material, so you could help in the abstracting process. Let's be creative and think big about things like this.

We need to do a lot more thinking about the difference between locking and non-locking function codes. The ANSI people have done some work on this, and this is good. In other words, you don't need a code to go out of an accent. You go out of an accent automatically because you don't have two accents in a row. You don't need a code to go out of fractions. You go out of fractions at the beginning of the next space. Things like this can be done. And, of course, we've got to have standardization of conventions.

Now I am not a programmer. Some people have said how can you talk this way, presuming to know something, if you

aren't a programmer. My answer is basically this: if you have diabetes, you know a lot about diabetes. You don't have to be a doctor. You're married to a woman, you know something about women, or at least about that woman and you know her good points and her bad points. That's the way I learned something about programming. You know there are possibilities as well as limitations.

I am an optimist. I think we can do the job. I liked very much the tone of Orrie Engle's comments because I think Orrie really has said to us, let's get into this thing together in some way. It's something where none of us are really bright enough to do it all by ourselves. And I personally find more satisfaction in the accomplishment than I do in the dollar. That kind of "Greening of America" I've given up anyway. And the kind of greening I'm going to talk about from now on is more in the relationship to the value of accomplishment and the kind of relationships between ourselves. And this is the basis on which, it seems to me, we can succeed.

SLATTERY

There have been many comments that have cut across a wide spectrum of activities which all of us are involved in. As are all the rest of the manufacturers, we at Mergenthaler are trying to understand how to make a profit and still continue to supply our customers with the facilities and systems which you need in order to make a profit. This gets kind of complex because, as has been cited several times already, the trend seems to be towards the specialization of systems in order to be able to economically provide a system for a particular job which will firstly enable the customer to do his job properly and enable us to manufacture a system for the particular application. Now we hope that this particular trend doesn't splinter into too many pieces because what will happen if it does is that we're going to have to be making tens and twenties of different versions of the same machine. This gets hard to handle from a logistic and servicing standpoint.

Let me give you an idea of what Mergenthaler is planning on doing and is doing right now to help with this problem. In Europe they are marketing a machine which is an advanced version of the Linotron 505. It uses a Honeywell 316 computer in place of the control unit. This machine is a general purpose mini-computer. It's programmed primarily for process control. Programs have been written for hyphenation and justification, guading, tabing, automatic leadering, base line jump, etc. many new features which are not in the current version of the 505. It is essentially a mini program for the composition function which is one of the ways of getting around the high cost situation with these large general purpose computers. If it pleases you one way that you can handle your problem is to pull out your composition modules, stick them in the Honeywell 316, and interface to that. Another approach, which is Mr. Seybold's approach,

is to modularize your large scale program and in effect stick the process control of the photohead and the basic typesetting program into a portion of your large general purpose computer and operate it in a multi programming environment. I think what we tried to do at Mergenthaler is stay with the changes in the industry and at the same time, in such a way that we evolve equipment and systems as the market changes.

The format processor is a much more wonderful machine than we ever expected. But it costs a lot of money and there is no one who wants to buy it. We are willing to build it if you want to buy it. It is very fast and it does get around Mr. Lannon's problem of high computer cost.

JOHN SEYBOLD
Ray Lannon told me that that processor would cost $265,000 and I guess they want more for it now than that.

DUNCAN
My problem is this. I work for two outfits; one the Bureau of Standards, and the other is with a standards committee. We're not very smart but we do have one thing that we can do that perhaps some of the others of you can't do and that is we are at liberty to make our mistakes in public and talk about them. Come out and look in the fish bowl and find out how many mistakes are being made. This we think is an important part of our mission. Now as Chairman of a standards committee on ANSI, I have the problem of being a systems synthesizer. A committee can't go any further than its chairman can understand what it is trying to do. And it is very difficult in this case for the chairman to know what he is trying to do.

I'm supposed to sell standards. Now standards are important. I will point out to you that salt is important because it has the same origin as our word salary. I have an uncle who was wandering down through Mississippi one day and his wife had told him to bring home a bottle of ketchup. He walked into this little store and he saw salt all over the place. "Do you have any ketchup in here?" "Yea." They go down to the basement and there were barrels of salt and hundred pound bags of salt everywhere. My uncle was a salesman himself - insurance, anything he could sell. "Man, you must sell a lot of salt". "Damn it, I can't sell salt, but that guy that sells me salt, now he can sell salt."

Now what I'm afraid of is that in selling you standards, I may be selling you salt.

HENDERSON
I believe that the free enterprise system will hone this segment of the industry to a sharpness of competitiveness and a high degree of perfection. I object to any concept of giving away software.

I think that we need to do something as a group to help develop this industry. I don't think we can go out and change the publisher but we can put a spot light on the publisher that is using the new tools and the new methods and making a profit and thereby influence the other publishers to take advantage of these tools. I think we can force ourselves to be more responsible business men and members of this industry if we put ourselves, to some degree, in a fish bowl. I have been with several companies that have spent a lot of money to develop generalized information systems for photocomposition. I feel that we have a general software system which covers 99% of what was alluded to as System X plus many necessary text processing functions not mentioned. Yet, most publishers do not even know that we, Publicate Incorporated, exist much less that we have this great generalized software system PI/ONE™

I again contend that the major problem is communication.

If there existed a central point where the publisher could obtain good, reliable information on the current state-of-the-art and on the service companies who can and are supplying these state-of-the art tools to the industry, we would all benefit. The publisher's decision as to what publication to automate and what service company to use would become much easier and the total volume of business being performed would increase. This workshop is a good example of this. People are willing to attend and the government is willing to spend money to help communicate.

As a programmer I have been a very strong advocate for many years now of saying that I am a bright guy and I have got all of the solutions and I am not going to tell anybody else about them because I'm going to use those solutions to make a profit. I don't think that has helped the industry and, further, I do not think it has helped me. Publicate is going to begin to disclose its concepts of design and the products that it is producing. Whether this will be a worthwhile contribution or not, I do not know, but I do feel that from the discussion I have heard here that we are performing at the peak of the state-of-the-art.

There is a major point of System X that has not been discussed which I characterized in my attached paper as giving "the biggest bang for the buck" to the information publisher, the publisher of the future. Existing publishers may not use these new tools but, if they don't, the new dynamic young publishers will win larger and larger proportions of the business and will be the information purveyors of the future, keepers of the gate, if we want to call them that.

There exists a young company, to which we're providing services, called Congressional Information Service. This company is an information publisher. They came to us while looking for service companies because they didn't want to buy a set of presses, a computer, or develop a new set of

software; they wanted to publish an information product. They have a winning publication that is organized around maintaining an information data base of all documents printed by Congress.

NEWMARK

It is important that we have better communication between the sectors of our industry. We have a choice of producing something very cheaply which the reader will then have a hard time reading or produce a more expensive product which provides the reader more information. The question of quality is important. I believe the hardware exists that will do the job that we have to do and that all we have to do essentially is to tie the software and hardware together to operate a program. The first step in modularizing is making a distinction between an input subsystem and an output subsystem using the input system to capture data. You keyboard and update until you generate a clean data base. This is independent of the fact that you're going to use that data base to prepare a book. Some parts of it may be special but basically it is the same type of keyboarding problem that you have in many other data base creation systems. I think it would be very helpful when we talk about hardware and software we break it up into what we need for the input section or the output section.

DOLBY

There has been a lot of talk about programming languages and programming systems; I would like to provide a basis for at least describing what a programming language is. In the first place, a programming language is not a language; it is a writing system, as a linguist would say. The important thing is that you and I understand writing systems better than linguists. They understand speech. But we don't have to speak FORTRAN; we write it. Now what's the fundamental building block of the writing system? It's the alphabet. And the characteristic quality of an alphabet is that it has a small character set. Forget your big fonts for the moment. The fundamental character set you need to transmit information is in the order of 40 to 50 characters. When you look at programming things like assembly code, programming languages, etc., you find that assembly code is no good because it has too many pieces over 200. When you look at the so-called higher level languages like FORTRAN, you see that these have the right number of pieces. In fact, you can take the union of all the basic operators of all the main languages and you only have 35 to 40 pieces. So that is your alphabet. A program then in a higher level language is one letter per line, if you want to analyze it from the language point of view. Now what is wrong with the higher level languages. Most of them are subsets of what we need. We use the superset. PLI tried to do this. What's wrong with PLI? It's implemented as a compiler; it's too big; it takes too big a machine. One version I looked at has a thousand error statement. I don't need that many things to tell me I am doing something wrong.

You take this small set and put it in the assembler as a set of macros. Now this is playable and it works. The importance of this is in the documentation. When a programmer writes a program that a machine can read, he has every right to say to you, if you can't read it, go away. Don't bother me about documentation. If the machine can read it, you with your eye and intelligence should be able to read it. Now there are certain things we require of him to make that reading easier. They are the things that we know about best, like we need spaces so that we know where the word boundries are. But even now many good programmers insert comment cards at appropriate places in the program deck. Then the next thing we need after that is a dictionary so that we amateurs can take the sequence of codes that we can't figure out and we go to the dictionary and look up that corresponding letter sequence. If it is not in the dictionary, then we go back to the programmer and ask him to define this word which we then put in the dictionary. That's the legitimate use of people and machines.

We do know already how to do the syntactic analysis, the higher level subject/predicate stuff. There has been a great deal of work done on this. There are automatic procedures which derive flow charts right from the program - that is all available now. Look at it this way, if we start building these dictionaries, if we all start working roughly on the same superset, we will get standardization in a hurry. We will be forced to do it in something like macros or subroutines at the assembly code level to get speed. PLI still goes too slow by five to one.

If we can get our friends at IBM and RCA to store these micros in core so that we don't have to go fetch them from the disk every time we call them, this will give us a very efficient system. I have been using such a system except for that last feature which sends my assembly times way up. We have been working on this system for the last couple of years. At the present time you can read the programs and they can be used.

We don't have a dictionary yet. But don't forget that Shakespeare was almost through writing when the first English dictionary was produced. It is time now to start working on the first program dictionary but we don't have to cease work until that is completed. We can work our way through it.

CARLSON

You may wonder what a farm magazine is doing here but I am speaking on behalf of backward publishers. We were one of the first mass magazines with millions of circulation to take advantage of the cheap per thousand rate and now we're one of the first to cut this mass circulation into little fractionated bits. So we wanted to be first again in another line so this year we are going to automated composition. I have a great deal of information but very little knowledge. My primary interest is in giving the editor a new creative tool and this amounts to some kind of display terminal. Envision the input subsystem as something like this. Capture the writers keyboarding immediately on some sort of display that he can move characters around on. If the author who makes his living punching a keyboard of some kind has a terminal costing $5,000 on which he can display something like bold face and italics, he can do some of the basic things that a typewriter does. He cannot do copy markup but he can create some sort of machine readable document either on disc or on tape, move things around and we find it is a creative tool. And then after this is once stored, it might go to a markup terminal which would be a $15,000 device with additional features that would allow you to inset editorial code instructions. What I am trying to do is to eliminate this manuscript which we all presume to be the first entry into the whole system. Now, two questions. Is any one familiar with or heard anything about the newer kinds of displays which display something with reflected light such as ceramic displays or the liquid crystal displays? I don't like too much this tube glowing at us out of the dark. Does anyone have any idea if professional writers will, in fact, use this and how many of them would use this?

ZURKOWSKI

I am the Executive Director of the Information Industry Association (IIA). First of all, I would like to comment on the general trend in the conversation here with regard to standardization and proprietary rights and software. I think while the group here seems to be tending in part at least toward some concept of sharing a standardized way of doing things, I note that in the Court of Custom and Patent Appeals that the trend in the legal arena is toward patenting the software. There is considerable discussion going on about whether this is legally possible. There hasn't been a great deal of discussion as to how the users of software view this development and whether they are going to be adversely affected by a sequestering of the software rather than a sharing of it. I think there is a trend in computer software running in a different direction than the trend that this conversation is running.

The next national meeting of IIA in March 1971 will be, in part, a continuation of this conversation. We'll have a section on information production technique and it will involve similar discussions to this but with the information publishers, the non-backward publishers, the experimental

publishers, the people who have been developing applications for this in a commercial way. A great deal of experimentation is going on in this area. CCM Information Corporation, for example, is taking over the bibliography of agriculture and they have developed a fast and dirty, as they call it, index to the bibliography of agriculture which just takes a certain number of words out of the title of the article and it creates a data base on that. I give this as an example of some of the efforts being made by information publishers to create a product that will serve the information requirements of the individual user in contrast to the user that you've been talking about here. We'll have, in addition to this section on information production and technique, a session on creating and funding the information enterprise and I think that section will describe a situation that is slightly different than the assumption that you made here, that you are trying to create a product for traditional book publishers. There are sources of information publishers in addition to traditional book publishers. They include software companies that have been largely service oriented organizations and have realized they have to come up with a product that they can sell over and over again. There are consultant firms that are also developing information products. These are the areas where you should become known and you should become aware of what they are doing because they are the people who are of the experimental bent of mind and who are trying to do an efficient job of creating a tool by which man can control his information sources.

TOMPKINS

Larry Buckland's earlier comment that the early Christians get the best lions reminds me of an event in the days of Caesar. There was a certain Greek, Hyphenatious by name, a pre-Gutenberg typographer, who went to Rome to seek his fortune. Unfortunately, alas, he was a Christian and he was found out. So they threw him into the arena and he promptly earned a permanent place in the rare book catalogues, the rare book history, by setting fifty lions a minute, phenomenal for those days. So Caesar soon ran out of lions and sent Hyphenatious back to Helvetica where there were no lions to set, or they could be set more slowly by hand, and he lived happily ever after.

Is it really that way? Do we really have the problem of being able to set too many lines per minute? Has there really, in our recent technological history, been an invention, if I may call it that, of comparable magnitude which did not, by some relatively direct application of Parkinson's law find itself fully used? There is, after all, a feedback in our society. Take the automobile as an example. Who would have dreamed in 1899, the early 1900s, there would be a need for that many? Well, there wouldn't be today if there hadn't been a Henry Ford to make it acceptable. People could buy the thing, and word got around that it wasn't really too hard to drive, and even some young

ladies drove. It was that easy to drive. And I wonder if one of the problems today is that we've got a wonderful machine here but we have not made it nearly as visibly acceptable. There are those who say 'Well, it's there and the customers just have to learn to use it', but that is what I mean. Isn't accessibility the focus this group should be concentrating on? For at least those of you who are trying to provide a service to the public, I wonder if the main goal isn't a better mixture of instructional information and public relations to your prospective market. In thinking about John Seybold's paper and then coming and hearing these things, I wonder if out of that blue sky will be found grounds for cooperation. I don't think this group could; it is much too diverse with too many private interests to cooperate on that kind of program development. But isn't there a basis for a development in the area of a good interface to the user, where the degree of standardization is basically at the level of meeting the customer's needs, to help the customer who refuses to come forward for fear he will be sucked in (like Duncan's storekeeper who is afraid to subject himself to the salt salesman)? If you can provide help to that class of customer (and I think he is fairly numerous) with the ability to go far enough in thinking through this thing that he can then come to the market place able to tap multiple sources for his job, and not be faced with the spectre of having to go back to his boss and say 'Here is a wonderful thing, but I can get it done in just one way, and if that company goes out of business, well, sorry.'

SCHUBERT

I mention the Graphic Systems Division because some of the questions that were asked at a previous session seemed to imply that I was with the computer division of RCA. I am not; they are separate divisions. However, I am somewhat constrained to use their computers.

I have heard several diverse points of view; people are saying on one hand that they are overwhelmed by the systems that they had presented to them and other people are saying that the software and hardware have been weighed and found wanting. I have not been overwhelmed by anything that I have heard here. Whatever any one of you has asked for is available now. All you have to do is put up the bucks to get it. You can go to Orey Engle and you can pay him to write the 101st format for you. You can go to Joe Meade and he'll make his machine stand on its head for you. You can go to Fred Faulkner and he'll set any kind of type you want to have set, if you will pay for it. When I leave here and go back, I'm going to gamble with some RCA money. I'm going to decide for RCA which of you people are serious in what you have asked for and that's where I'm going to put RCA's money. But I won't put it there unless you are going to buy what I develop. The only thing that is missing in this industry today is a commitment to a direction to allow the manufacturers and the buyers of the manufacturers' equipment and the writers of software to make a profit from their efforts.

KOLB

John Seybold mentioned some features of what he thinks a desirable software system would be. We have a system which meets some of those requirements and which has not been widely publicized. The reason it hasn't is perhaps that it was written for the other computer company. The system is in operation at Colonial Press and was designed for books. It does not take a programmer type to do the mark-up. A mark-up man with a little extra training can do the mark-up. The keyboard is the TTS keyboard that they have. They process through their Honeywell computer. There are several correction techniques, which you can get at a very early stage of the input and correct it. At almost any stage in the system, you can produce output to the CRT, look at it in galley form or page form; and then go back in and correct that form without processing everything through the entire system again. For example, you can come out in galley form, make a couple of changes, and go directly into page format without going back through any of the input programs. I think these are superior system qualifications and relate directly to John's suggestion.

SHATZKIN

I think Mark Newmark put his finger on a very important and useful thing when he suggested that it would be productive for us to look at separating the inputting subsystem from the outputting subsystem. And in doing that, I think that we would find that there is a whole classification of inputting requirements that differ with the nature of the installation. His would be different from Farm Journal and Farm Journal would be different from the newspaper which would be different from a book publisher, etc.

This doesn't mean that they have to be individually, completely different, but there could be different classifications because of the difference of needs. I can think of two useful general requirements for an inputting subsystem. First, it would be desirable for this input subsystem to be able, without interacting with the outputting system but simply within itself, to bring all corrections and updating to the point where the input can be handed to the outputting subsystem without having to go back and forth. The other requirement would be that before the input was handed over to outputting, it should be possible, without too much trouble, to predict precisely what the result will be.

If you keep the interaction between the inputting subsystem and the outputting subsystem to a minimum, you will qualify a large number of potential users who are not now able to use inputting computer composition. Among such potential users are those who would like to complete the work in their own office and then hand it over to a service bureau to give them back the typographic results.

SITES

I think the point very valid. I think there are a lot of potential users of typesetting who are not involved in major publications who cannot afford to spend money on developing software packages and who would like to time-share. I think that the industry has been greatly lacking in the ability to provide software packages which would allow secretaries, or the persons who are going to keyboard the information to code the information properly. A small office cannot afford to have somebody there to mark copy. They have to do it themselves and the language which the user uses must be intelligible and simple.

BUCKLAND

What Dolby says, I think, is very important. I find that the software system that we use which runs on a digital equipment system has just these characteristics. There are macros that are stored on disks and the programs that we write are self-documenting. This seems to be more economical than the sort of brute force higher level language approach. If I can get in a little complaint, a lot of the software requirements set out by the Federal Government and from some of the larger commercial people who want to buy software specify some of these things which are in the long run not economical. Often I see an RFP which says that a system has to run on a 360 and it says that it has to be written in a certain language which is very inappropriate for the production characteristics of the process.

Some of the companies providing processing services for their own proprietary software haven't been doing a good enough job marketing. I know that our company has done some pretty nice work for McGraw Hill that few people know about. I know there are a lot of people here that have done good work that I haven't even heard much about. So maybe there is a requirement for getting this information around and then the users who can't afford their own software can more easily find the right people. If you could provide these services through a terminal so that you don't have to write a lot of letters, you could do all kinds of other business documentation supporting the production aspects of the job done, the services would be more useful.

FURTH

In self defense, I would like to disclose that the text processor pagination 360 program is now available. It is ready, working and available. It works under DOS on the 360/40 with 128K core. The point that I really want to make, however, goes back to the recommendation that Herman Parks made about simulation. Why don't we spend some time, effort and money in the group to explore what simulation programs are available that can evaluate the many variables which go into the subsystems that are needed in type composition? I think this would be an effort that would lead the public being able to evaluate what they have to pay for if they want the quality, the special

features. This should also lead, hopefully, to more knowledge about what ought to go into the hardware and software. I would like to see more discussion on that recommendation.

SPERR

I think one group here that is conspicuously absent is the ultimate user. I am not talking about those that have R&D development but regular commercial publishers. Even though we are considered a University Press we are really operating pretty much on the principle of commercial publishing. I think the hard fact is that most publishers aren't very interested in how it is done. They are interested in what it costs. I think this is really what it comes down to. Although we have done books on CRT, we have gone away from it again because of the cost. This question came up last January at a meeting here in Washington, D.C., sponsored by the American University. The cost question came up and it was clear that if people are not terribly cost conscious, they quickly price themselves out of the field. You have to look for what the customer wants. The publisher is not that interested unless he has a very specific thing in mind like retrieval. Regular publishers are not particularly interested in how their work has been produced but what it costs. That is really where the trouble is.

FAULKNER

It is time to speak about the every day facts of life. I mentioned in passing yesterday that the economic viability of companies like our own is in serious jeopardy. If you ladies and gentlemen want to use a cathode ray tube output device, you had better do something to see that it is in fact available to you at some time in the future. There has been a great demise in the number of suppliers who are available to you. In order to protect the opportunity to engage in some of these very lovely systems, you better be sure there is going to be someone around to produce it for you.

This brings us to the point that we had better utilize what we have now to the very fullest extent. On a parallel path, develop the super system by all means. Each of the systems that are existing today, I'm sure, has some shortcoming or other. But inherent in this equipment is the capability to probably produce 95% of the composition of the whole country. So we're spinning our wheels here on a proportion of the market that is very small - ignoring the necessity for keeping sources available to you. Some time in the future, as these marvelous systems become a reality, then the number of people like ourselves will become greater again. But there is no incentive for anyone to enter this production place today. In fact, I think it is fair to say that most all of the people operating CRT equipment today are losing money. I only know of a few who can say that they are making any money. Let's use what we have now. Keep us alive so that you can in fact have an output capability when we come up with this marvelous software.

JOHN SEYBOLD
Joe Meade's secret of making money using a CRT system is that his programs are efficient enough that he can sell two-thirds of his computer time to non-typesetters.

SCHARPF
I want to refer back to Bill Tunnicliffe's presentation on System X. Several of us have indicated that, true, what we have available today in the RCA and other similar systems is a great deal like what we talked about as being part of System X. But I think there is one big difference, too. They each require a particular type of input. We've talked about the varieties of input that are needed to meet the needs of the industry as a whole. But the input that is being created as a means of information creation is still back the way it was when we were creating just for typewriting, for line casting, this type of thing. What we are talking about more is a different way of life in the beginning stages of information creation, to allow us to get across this hurdle from initial information creation to the point where it has to be put into the systems that are available. We're talking about a way of life in the creation of our data bases whether they be input to computer files, the scientists' publication or a paper I write. This is as much a part of System X as anything else. The information creation itself has to be done in such a way that makes it possible to easily go to the features of the RCA system, the Harris, etc. It requires more than just a single program; it requires a level above that to get to the people who are interested in creating the information.

We started on System X back in 1967 and we've gotten a good bit of cooperation from some of our members in GCCA which is a national membership organization within the Printing Industries of America. PIA is the largest trade association in the graphic arts and is composed of some 6500 printing company members and another thousand or so suppliers. GCCA, which includes publishers as members also, was created to enable people to work together to develop solutions to computer problems on a joint basis. We are involved in many areas. We have received a great deal of cooperation from our members in creating systems for estimating or work on production control. In the composition area, we found much more difiiculty in enlisting support. I think it is for two reasons: one is the spirit of competitiveness, and the other is that people have been too busy working on their own systems to spend much time working with a group. I am pleased by what is being said here and the expression of a desire to cooperate with others to build upon what we each have done. So it's encouraging to me for our group that we will be able to look to our members for greater support and to look to those outside our membership for support as well.

ANDERSSON

People will ultimately use something if it solves a problem they have. People buy automobiles because they have a transportation problem. Mr. Carlson asked whether or not word smiths use CRT terminals and I maintain that word smiths will use them if the CRT terminal system is constructed so that it solves a problem which they have in editing or preparing copy or whatever. If it doesn't solve their problems, they won't use them. Now we can go one step further and look at this large omnibus program system we've been talking about here - the super system that will do everything. I maintain very few people will buy this because it doesn't solve the particular problem they have. They have a very small problem and they are being asked to buy a system that solves a very large program. And this is why these super programs have not been written. Nobody is at fault; we have been ignoring the situation. Back to the transportation analogy; you can buy an automobile that will also function as a boat. I know some automobiles have been built that will fly. You could put all three of these together for a very large amount of money and you would have something that would fly, sail and could be driven along the road. But then it would be too expensive for anybody to afford and it would be too much for anybody to handle.

TUNNICLIFFE

This is not necessarily a super system per se. The two things that have been emphasized are an input system and viability. The underlying fact is always economic viability. One of the principal purposes of the System X approach is to divorce the customer (be he the small one or the large one who is only interested in the per page price) from the process. You allow an input language that is in universal use, if you object to the word standardization. They don't have to know what happens after those identifier codes are entered into the machine and in many respects it would probably be preferable if they didn't. The characteristics of the existing languages can be linked into this and then this is simply a matter of communication among the manufacturing processors and between the manufacturing processors and their customers. This point has been largely unaddressed in the remarks that have dealt with hardware and software and I would suggest only, and invite comment on, what I consider to be the principal point which is the input language itself - which I have classified as one of identification and specification.

WIGINGTON

The comment has been made that we should consider the ultimate user, the originator, the author, in capturing original input. In doing this, you need to fulfill a problem that he knows he has. He may have problems that he doesn't realize. To illustrate this, I could use a dictating machine if I wanted it, but I don't want to use one. If I had a terminal, because of my inclinations, I might use one, much to the dismay of my secretary. What is needed are some people who have the inspiration and the understanding

to show the way that source information capture can be put into more widespread and profitable use. It won't come in to use just because it is technologically possible.

JONATHAN SEYBOLD

Ron Henderson and Larry Buckland have deplored the lack of publicity and knowledge of what people are doing. I would like to remind them that the vehicle for this exists. I, personally, would be elated to see more than just press releases. I would like to see information that would describe how a system works and what it does and what the several firms in the industry have accomplished. This is the sort of information that will advance the state of the knowledge in the industry.

Two points have been bothering me in the discussion: one concerns the question of modularity. This can be taken in two ways, one is to describe an input module, a hyphenation module, an output module, etc., which are not initimately related to each other. People seem to be describing this kind of modularity. That's fine. Systems have had these elements all along. What is really meant by modularlity is that each program consists of a number of pieces to be plugged together in a functional sense. This means that you can select those pieces which reflect your particular needs and construct a very simple, very small program tailored to your application. If you don't use hyphenation, don't put the hyphenation module in. It also means that if you think you have a better way of doing hyphenation, you can write your own hyphenation module and plug it in to replace the standard module. This is one way around the problem of unique solutions or specialized solutions for specialized applications. There is a lot that must be done that is common to a great many applications: a newspaper, a textbook, a technical paper, generally all require hyphenation and justification. You might want quite different total hyphenation-justification programs for them, but many of the program modules could be the same for all these applications. The same thing would be true for a display advertising or even a chemical formula module.

The second point is this! Both users and publishers recognize a need for simplicity and this is one of the greatest failings of current systems. They are enormously complex. This goes right back to the secretary being able to prepare input. This is what we have to deal with. Most users have a well defined idea of what they are trying to do. They have to be able to do this as simply as possible, so that they can train people of reasonable intelligence to prepare good input and so that they can run the composition system with a minimum of fuss and bother.

SLATTERY

We've been through the mill on large systems development. We've developed a Linotron 1010 system and a typography program for the 360/50. It took us a lot of years

to do it and a lot of dollars. The System X that is being proposed here is very much the same kind of system. The approach is similar to what we used to develop our typography program and I can guarantee you that it is going to be a very expensive system to develop. We came to the conclusion, as Harris and a lot of others in the field have, that to try to develop a system to do everything for everyone is impossible, if not from a feasibility standpoint at least from an economic standpoint. So the best thing to do is to try to build on what you have already, both in the hardware and in the software area.

Now System X or a general system is fine, but I think, as was mentioned earlier, you have to consider the interface. A flow chart is really necessary. What does our production flow look like at the interface? If you talk about a general input system, this is fine, but what are you inputting? There is a great diversity of input in terms of both type and source. There should be a standard input system for that but it is very difficult to standardize. Now you come to some sort of an editing system where you can update and correct easily. That could be standardized. And now you get into the point where you are in a composition program. You've taken the data that was in the data bank, it might be a whole book, and you're now processing that through a composition program. Please, don't standardize these processes because if you do, you are going to put the clamp right on all the competitive aspects of hardware and software development and the benefits therein that you derive. If you allow these developments to stay on a proprietary basis, you will continue to have competitive development of software and hardware that will take full advantage of the hardware that is available and will be available. You want to leave that on a competitive basis. You don't care about that as long as you can easily manipulate the input and you get the output you're after in an economic manner. You don't really care what the composition programs look like, how they work, how modular they are, or even what the hardware configuration is, as long as it is reliable.

JOHN SEYBOLD

Bill Tunnicliffe's System X is not the same thing as my proposal. System X is an input preprocessor interface and I would not like to see that go down the drain because my ideas go down the drain. They should be evaluated separately.

DOLBY

A point was made that there are competitive needs to keep people in business. Let's remember that the more successful things that have been done have been processing telephone books, directories and other things where you were giving something extra to the customer, namely, he doesn't have to store a warehouse full of lead, or he doesn't have to re-keyboard every time. We have to find

ways to make the book composition program more effective. We're trying. We have our automatic indexing program that we are about to start selling. This means that you can go to your author and say: 'If you come through us you not only get it done so that it will look like the other stuff, but you also get the index that comes back with the page proof.' Now you have something extra to sell. I think this is important.

How about protecting these things? This point was earlier. We protected our second hyphenation effort. In fact, it is so well protected that nobody has ever heard of it. I've still got it. I'm almost ready to have a f re sale on a hyphenation program. We're going a different way with automatic indexing. In fact, we will make use of CIS and anybody else that guarantees to publicize things. We're going to publish the paper specifying exactly how the thing works and those of you can program things can pick it up and program from there and there is nothing that we can do about it. However, we have it all programmed - it works - and it's fast.

Your programmers, your good ones, the ones who can do something comparable to what we already have working, are usually pretty busy. So it occurs to me that I might even sell this to Larry Buckland, if he has the need. Even though it is on a different machine. Because I will not only give him the program, I'll give him something he can read. Reprogramming it with his micros which are different from mine (probably not too much even though we haven't compared notes) will be a very straight forward job and would be cheaper than for Larry to put his best man reading my paper and then rewriting the whole program. That's how we want to make the money. If we can sell several of these, we'll do rather well.

I would like to refer again to modularity and back to letters and words that I described earlier. Most useful programs that you expect to rework run about the length of a sentence, a few hundred characters of instruction at higher level language. You get a program any bigger than that and the programmer who did it doesn't want to touch it. So modularity in one sense says 'Build sentences as programs. If they get any bigger, split the job into pieces.' We all do this in various ways. Now, within modularity then, are phrases and words. These are meaningful ways to look at it. I think the sort of thing that Jonathan Seybold was bringing up is quite accomplishable in those terms. If you want to hack out from our big hyphenation algorithm (if anybody will ever buy it) two-thirds of it so that it will run faster and that is all you need for wide measure. Fine. You identify it. And we even have statistics on how the pieces work so that you can throw out the bad ones while you're at it.

ZURKOWSKI

I detect a theme that seems to be developing here - that we live in a fish bowl or would like to live in a fish bowl, like to share these basic concepts. Interestingly enough this concept is the underlying concept in the IBM program registration system that is an alternative to patent and copyright. I do think that part of the problem that we are all addressing is what is the mechanism by which you can both protect your product and still make some money before the period of protection is ended. And that is the underlying theme in the Constitution on which copyright and trade-mark depend.

DUNCAN

I rise as a physical chemist about to give you a lecture in history. I rise as a Southern country boy who from time to time reads that Constitution. About twenty miles down the road, there is the home of a guy named George Mason, a relative of mine. He stuck something into the Constitution in the first ten amendments. That is where free press comes in. It was a Southern boy that stuck that in there. I think it's the sixth power of Congress that says what we patent and copyright, the right of an inventor to the benefit of his inventions and writing shall be preserved. Why this lecture?

The patent fish bowl was invented in the Constitution. Now, if our Patent Office is failing you, it is not a part of our problem. A patent is your complete disclosure of how to practice something so that somebody skilled in the art can understand it. If the patent system is working right, you will disclose and your right will be protected. If you want to make money in this business, and if you want to live in this fish bowl that your system has built into it, don't look with horror when somebody is trying. Your lawyers, who you seldom talk to, are trying to figure out how to tell you to patent a piece of software. Get your programmers in there and teach them something about patent law. Then you will have all this stuff revealed and presumably you can make money at it. Now the reason I'm mad is because I happen to hate this patent business and that is the reason that I work in a fish bowl so that everything I do is in the public domain and I worry nothing about patents.

STRAUSS

True, I did not philosophize in my earlier remarks. I have too high a regard for philosophy to call those remarks philosophy. I simply wanted to point out the environment in which we actually do live as opposed to this little room. I am trying to point out reality. I have two things that I would like to say. One is a remark related to the way the capitalistic system works. I should like to remind you that one of these ways is that in certain cases you end up in the bankruptcy court. That is an essential part of

the system which we usually do not wish to recognize because it is one of the less pleasant parts. Two, nobody who wishes to stay in business should put that burden on others, least of all an 'industry' which is nothing but a mental construct. Nor does it make sense to threaten a whole industry with going out of business. Those who wish to succeed must time right, plan right and know the basic laws of economics; above all, they should understand the environment in which they wish to succeed.

HENDERSON

I would like to go back to System X. We have talked about input systems and output systems. I think there is one major part we have not talked about and that is the data processing system in the middle, for handling an information data base, for performing many of the functions that the publisher must now perform manually. For example, American Geological Institute's monthly abstract journal has been published using a system that sorts, organizes and cross-references all the indexes and creates an information data base from which they can select other publications with different sequences of data for some four or five years now.

This is an integral part of supplying a service to the information publisher. I know many publishers do not feel that 85% of what is printed in books has any informational content worth keeping in a computer information data bank. Currently, the AGI is considering going back and keying all of their back issues to enter the data into their GEO REF file. From this base they not only sell computer searches but also publish selected Bibs.

For the University of Kentucky, we just produced a bib of all papers on coal in the state. This data was selected from the GEO REF file, organized and indexed, and phototypeset by the PI/ONE™ system.

If we progress technologically in the next ten years as we have progressed over the previous ten years, we'll be able to sit at a TV screen or an entertainment center at home and have access to all the information that is stored in information data bases. Unless the publisher is storing his intellectual effort in machine readable form in some structured fashion where it will be available to the public through these new communication and terminal systems at home, then he is going to be in a bad position to compete with the publisher who has these resources. I think that this is the message that we need to get to the publisher.

In defining System X, Bill Tunnicliffe talks about flags or tagging information. We have to remember one point in talking about flagging the input in a standard form for composition. If the publication has information content, which it does, the composition of that publication is dictated by elements of text in the publication. We may wish to set a word in italics in the middle of a title. That

word is then in italics for emphasis. Now the title in an index of that publication may be in italics so we would want to set that word in a different type as a different state of emphasis. We should define such a data structure very simply; unless we keep it simple, it won't work.

I come back to programming because I am a programmer. There is a common saying which applies to programming -- remember the kiss, keep it simple, silly. That's also a good rule for input.

TOMPKINS

There is no reason for System X to be so complex that some code always needs a fix. There can be a System Y if the System X concept can be kept simple. From all that I have heard in these sessions, a System X is a necessity and it is going to be invaluable to the industry when it comes. What is very unclear is, does the industry have the means or the desires to see it come? Does it have the ability to guide the thing so that it does remain simple enough yet able enough? I am sure this is in the minds of those who are working on it, too. It is a tough problem.

JOHN SEYBOLD

I am going to interject one very brief point here. We haven't talked much about programming language. You know, assembly language versus high level language. I would like to ask Jim Dolby to comment on what he thinks. Is there a possibility of 'portable programming' in this field?

DOLBY

Yes, but in one sense only. If I write my programs in higher level language that is imbedded in assembly codes, they will run fast and if I am using operators that are quite similar to ones in languages like PL1, FORTRAN, COBAL, etc., then Larry Buckland can understand them and John Seybold can understand them and if they happen to be using the same machine and have the same set of macros, they can use them. They can be portable. They can further read them and jigger with them, which is an essential part of this. The notion that we can write programs and can't read them just won't live any more. Now as far as assembly codes go, I just do not see people who are trying to work at the more complicated edges of this system living with assembly code per se. Macros in the assembly code - fine. You can do anything you want with 20 to 30 macros. Sometimes you may buy a little inefficiency that way but that is enough to have to cope with if you have a complex problem. The notion that every detail has to be spelled out with 20 strokes of the pen for each letter just won't fly anymore.

BUCKLAND

We have a continual fight in our organization as to whether to or whether not to modularize and I think it boils down to how long these modules or whatever you are

going to call them take to run. And we've found that for a good number of problems if you keep them small enough, you can get in, run them and get out before the next guy in the queue wants to come in. The alternative is to write re-entrant programs. Although these are expensive to write, when you think about multi-terminal editing systems with a half dozen people editing and setting type at once, they become an attractive consideration.

My company is totally committed to having all of the intellectual input and control of the whole process be under the direction of the customer. We have a big computer and we may or may not get one of Ed Kolb's typesetters but the whole process of setting up the job, keyboarding the data, editing and all of that is that it would be under the control of the guy responsible for the intellectual content of the document. At present, we have to sell our services to the production manager and he is not always sympathetic with the long range view of what goes on in a man-machine sense with the guy who is doing the creative work.

As an example, take one special kind of publishing which supports the review function. So many primary publications are being produced that more and more effort is being put into secondary publication or review. People are digesting what other people are saying and selling the digest as current awareness publications or bibliographies or things like that. A lot of the functions of this kind of review publishing involve a lot of hard detailed work. People responsible for creating input for these secondary review publishing systems are going to create their own machine records. They can use the computer to help them in authority list control, proper noun control and a lot of things which they now have to do by hand. So for that class of publication, I am sure customers are going to create their own machine data.

Others, like newspaper reporters, people running the spectrum from the editor down to the reporter who are under tremendous time pressures, will also create their own data. Even if the author doesn't, he will have someone close using CRTs who can create data for him. If the copy passes under some eyes in the keyboarding process, it should be someone who is connected with the publication. Someone in the publisher's office can spot all kinds of errors in copy that a vendor can't spot.

This author or editor control of the production process eliminates what I call double editing. If a customer sends me copy and I key it and send him back proof, it goes back to him, he proofreads it and makes corrections to errors and also changes in content. He really edits it at that time. It comes back to me and I correct the machine file. Then it goes back to him and he sees if I did my job right and that it was properly corrected. Now that involves two processes which are nearly identical. If he

has control of the copy to begin with, he only does it once. I have to guarantee him that my machines are not going to foul up what he has done, but that is purely a machine consideration and I think such controls can be developed.

I think this customer control of the process is the way things are going to go and I'm committed to this approach. Now there needs to be a lot of work done in interface languages and on order forms which we can give a customer so that he can set up jobs easily and correctly.

WIGINGTON

Concerning the issue of assembly language versus compiler language, our experience at this point is largely as an assembly language shop, with full use of macros suited for our needs. We very seriously have studied where compiler languages can be effective. It is not a question of one or the other. I think it is both and you use each where it is appropriate. You must remember that a compiler is a trade-off between machine resources and people resources. When the balance goes in the direction of saving more on people resources or aiding change or something else of that nature, then it pays to spend the extra machine time, the extra care, or whatever it takes to do it. In other cases one may find that a certain small section of his code is eating up a great amount of his resources in continuous high volume production. Now that is obviously a target to redesign, recode and get the benefit out of assembly language execution efficiency.

As far as exportability is concerned, that is a very complicated subject. As has been noted, anyone who has tried it won't ask the question simply of whether the program can be written generally for everyone to use. Our experience in this has been yes, programs are exportable under some conditions: (1) the recipient understands what the functions are that are being carried out; (2) he has a competent staff both in the functional area and in the computer science area to be able to take the programs and work with them; (3) the documentation is adequate - maybe even over-adequate - so that if he cannot interpret the code he can read about the code and he can then take this, the set of blueprints, if you will, and apply it to his own installation. The engineering of something for multiple use, and most software has not been engineered with that view in mind, is much like building an aircraft carrier. You don't do that with three guys and a scratch pad.

FAULKNER

In answer to Victor Strauss's earlier comment, the assumption of performance was inherent in all my comments. If we don't perform, we certainly don't deserve to exist.

DOLBY

My view is that assembly code is not useful because it is too costly to program. Compilers are not useful because they are too costly to run. What we need is a high level structure in the low level assembler. It is possible. People are doing it and that is where I think we are all going to be forced to go. Now, you can get by with a PL1 and the occasional added piece for some things. But you can't give five to one in execution speed. There is no way around it. Any instruction you want to execute in PL1 you can simulate with a macro in the assembler.

BUCKLAND

There are a good number of successful applications that don't fall into the parts list directory kind of problem which are being performed by quite a few people here. There are successful applications of setting of pretty complicated text. And so I could have asked the question, What is all the problem about? Well, what I think is that the problem is about those jobs which have not been adequately defined in terms of their data base and which at the outset the author, when he is ready to buy the service, doesn't know what his data base is. These are the jobs where you get halfway into the thing and the intellectual structure that Bill Tunnicliffe was talking about isn't there. In my own work, I have had to use this "typographic emphasis" (Bill Tunnicliffe's term) to bail myself out of bad data base designs. This is done in a situation where, if I cannot derive a form from the function of a data element that I have in this system, well then I override with some typographic operator that makes it like the customer wants it.

If you look in a style manual, there are hundreds of uses of italics. Am I going to define a data base so that every time I hit a foreign word I say shift, flag, FW tag for foreign words, then shift back to normal body text. If I do that, I will end up with a data base structure with thousands of elements. This is the problem and this is what is making the processes complex, as Jonathan Seybold says. This is what is making my costs high the first time I do a job for a customer.
But this is part of the game that we have to learn to play if computers are going to serve the intellect.

JOHN SEYBOLD

In summary I take it that the sense of this meeting is that we do need something like System X as an input concept; that we need widespread publicity for techniques of input which involves the understanding of structure, form, data elements, and so on.

I take it that it is the sense of this meeting, second, that we need not only to devise such a system but also to educate people widely in its use so that it becomes a useful tool.

I take it that it is the sense of this meeting that a very ambitious software solution is not yet to be undertaken by government in conjunction with industry, that the private boys should have another whack at it and see whether they come up with something which is adequate and which will go. And that we need to use existing software as creatively as possible and perhaps define the problem further.

I take it that the major sense of frustration that is surrounding us is really not so much a frustration at the software but at our inability to use the software, to get into it and to get out of it.

Panel 4
Costs and Economics

DRURY

As a former printer, I think I have been dragged screaming into the 21st century in the last two days, objecting all the way. First of all, I do not know computer language. In the first session, I recognized the word "interface" because we use it in government a great deal and in the second session, the other word I recognized was "computers", but seriously, I am here as an industry specialist, an economist, a former printer and a representative of the Department of Commerce.

I have put together a few remarks as a workshop paper and I am glad that I did after listening to the discussion. We all have to look over and over again at this industry which we call graphic communications but which is really printing and publishing. Newspaper publishing which varies considerably, depending on whether you are a small weekly, medium sized daily, large daily, each have their own requirements for the hardware that we have been discussing. Periodical publishing is quite different; book publishing, again, also different. Newspapers get 71% of their revenue from advertising so they are ad oriented. And they are competitors for the advertising dollar which only grows approximately 10% in total volume per year. Their competition is terrific whether it is direct mail, magazines, black and white TV, color TV. and now CATV is coming in.

Another thing to keep in mind in your selling and your approach to this industry, they are all small businesses. If you eliminate a small number of big companies, you are then down to small businessmen. In the total printing and publishing industry, 81% employ under 20 people. Your marketing, therefore, has to be oriented towards the small businessman. Another point, he doesn't have much financial muscle. It's a highly competitive industry. The small and medium sized printers contribute the bulk of the products. It isn't like the steel industry where two or three large leaders set the pace. So these are characteristics that affect marketing, affect how you sell and even affect the language that you use. I think sometimes by the use of the term "phototypesetting" and "computer", we scare the printer. I know that you have scared me here today. I think that in your sales effort you've got to talk simply and present the fact that this is a very economical method to use.

A couple of other characteristics ought to be kept in mind. These industries are long established and, unfortunately, we're traditionalists. We've been in business for a long time and you can't tell us anything about how to run a printing business. On the other hand, commercial printers particularly (also newspaper publishers) are very innovative. If anything, the commercial printers are "gadget-happy". They are too apt to put in a new press

costing $500,000 and then say, what do we print? A newspaper publisher cares about just one thing and that is to get his newspaper out. How it is put together, he couldn't care less. And you have that going for you.

Another thing that is going for you, and it's forcing some changes in the industry, is economics. I recently looked at the very fine publication of the Bureau of Labor statistics on union wage rates. When I entered the printing business in 1937, the index of union hourly wage scale for all workers stood at 37.0. By 1950, this had become 75.1; by 1960, 106; by 1967, 131.0. In my lifetime then, I saw labor rates increase over three and a half times in a period of 30 years. In that same period, the wholesale price index of printing paper and printing ink increased two and a half times. Now if we place that data within the context of a group of intensely competitive businesses faced by a continual labor shortage, and we still have a labor shortage, we then can see why the printing industries are involved in a technical revolution and that is why you gentlemen can sell computerized typesetting equipment; why we are swinging into offset; why we are swinging to automatic platemakers and film developers.

In 1961 we had two offset dailies and this year the ANPA estimates that about one-third of all dailies will be printed by offset. They predict further, by 1978, 1376 by offset, 180 by letter press; so there is a growing market. In the weekly area, offset went from 500 plants in 1962 to 5069 in 1970. Again, this is not just happening or an accident. Newspaper publishers in their wide scramble to remain competitive with other advertising media are battling the back shop costs. It also goes without saying that most offset newspapers are set by phototypesetting. And we know the marriage of phototypesetting to offset printing;particularly the web offset has been an extremely good one and a profitable one. So far this year, newspapers have been off somewhat in lineage but they have been ahead in advertising dollar revenues. In the magazine area, the general magazine is off somewhat. Business press is now off 11% in ad revenue.

Some of these industries have some very weird things facing them. Let us go back to newspapers again. The traffic congestion in the Washington area means that I get my Evening Star which has been printed at 11:00 o'clock in the morning at 5:00 o'clock in the afternoon out twelve miles in Falls Church, Virginia. Now I am getting really a late Washington Post and am not getting an evening newspaper. This is true in all of the large cities. So what the newspapers probably have to face is the use of facsimile from an office in downtown Washington to satellite plants scattered around the area. Then I will have my evening paper and it will contain the latest news.

In the magazine area I also did some counting for magazines devoted to special interests. Standard Rate and

Data list 61 major classifications of consumer and farm publications. 93 magazines offer geographic and demographic editions. In the business press, about 130 major classifications of consumer and farm publications. 93 magazines offer geographic and demographic editions. In the business press, about 130 major classifications with about 3500 magazines listed. More and more of these magazines are printed by offset and in the period of 1963-67, where we have Census data, dollar volume by offset more than doubled.

To sum up, I think we can say that you are selling to small businesses, to growth industries. You have a number of things going for you - labor shortage, high labor rates, high cost of materials and this all makes for a good market and a good future for phototypesetting.

CREMONESI

My remarks will be complementary to the paper that was provided for this workshop. We are the guys at the bottom of the totem pole who have to get all this material into some printable form. We've got to take the responsibility for seeing that the book, magazine or paper gets out. And it occurs to me that in the two days that I've been at this workshop I feel somewhat like the angel that was sent down to see how things were going on Earth and suddenly found himself in the middle of a raucous bar where they were having a discussion on the hereafter. While we are presumably talking about being part of the printing industry, actually I would guess that most of us in the room are relative newcomers to the printing industry. When you're dealing with the printing industry, you're dealing with not so much traditionalism, as was suggested, but with an industry that has been developing for 500 years and has been affected by developments in peripheral areas, developments in writing, art, and layout. The printing industry today is one that has developed a very high level of knowhow in the handling of printed material and everything that I've mentioned so far I'm sure is entirely foreign to you. You know a great deal about computers and programming, systems, but we haven't yet reached the point where we can call all of these programs and computers and systems a true part of the printing industry.

At the ITU headquarters in Colorado Springs, we have a training center where we teach, among other things, our members how to program computers for the graphic arts. We have graduated about 200 or more members from the computer programming class. I would guess that not over 15 or 20 are actually working as computer programmers. This is not because they are not qualified, but simply because our employers have only a vague conception yet as to what the potential of the computer is. This is a fault of yours. As computer industry management, we know that the New York Times, for example, could eliminate its composing room of about 1000 men over night and reduce it down to 50 or 100 men using CRT typesetters and computers. The reason the New York Times has not done this is because it would take

longer to prepare the copy for the cathode ray tube typesetter than it does now to get the paper out, using manual linotypes. This again is the fault of the computer industry management. It is part of the schism that still exists between computer technology and the printing industry. As an example, we get an aggressive secretary at a local union, who insists on becoming a computer programmer; he likes the work; but then he has to beat his employer over the head to give him an opportunity to do programming in the plant. With the kind of discussion that we have had here in the past two days, we could expect that this kind of programming in the plant. With the kind of discussion that we have had here in the past two days, we could expect that this kind of programming would be going on in every newspaper that has a computer. There are now about a thousand newspapers and printing plants around the country that have computers, half of which are general purpose computers that could be programmed by the local employees but are not. We are still influenced by computer manufacturer selling general purpose computers with canned programs and convincing our publishers that this is the only way to use a computer. This is a ridiculous situation. And it is one that we are objecting to as printers because we can see the computer not as a means of getting rid of our jobs; we can see these things as new tools, to make our job easier, make it possible for us to get out the printed product with less effort and to make it possible for us to look forward to longer vacations and higher pay.

I make these points solely to emphasize that with all of our advance technical knowledge and there certainly has been a great deal of it displayed here, we have got to get closer to the practical problems of printing. And we will not solve many of the problems until we do learn some of the practical problems in printing. When the discussion bogged down on the question of hyphenation and justification, I think this finally set the cap on the separation between your church and our state. The printer has had this and hundreds of other problems that he has learned to cope with as part of apprenticeship. He simply meets them. Has anyone here, for example, made up a book and you get to the last page and you find you have a half line left over? Has anyone ever scanned down a page of a book and found eight hyphens in a row? Now these are the practical problems that seem silly because you are seeing them from the outside, at arms length, but to the printer these are the items he is concerned with in order to produce a piece of quality printing. If he doesn't concern himself with these problems, he is not producing something someone will read.

LANNON

I should like to look at the problem of economics from the perspective of the U.S. Government and break it into four categories.

First we have the "economics of timing" where the speed of publication has great impact on costs outside the

publications process. For an example there is Index Medicus where we deal with information that impacts on disease, human misery and the allocation of scarce research resources. Another example is the system of the Air Force. Here speeds of publishing give improved control of inventory. In these examples we are not necessarily interested in saving money on composition but rather in saving money on the end results of our composition.

The second category is what I term "societal economics". Here I refer to the costs associated with the rapid decay rate of information. Text-books, for example, (and many in this group who are, or have been, teachers will bear me out) are often obsolete after two years of use. The reasons for this are the explosion of information and the length of time it takes to get something published. By the time a typical text-book is in the student's hands the information is several years old.

The third category is by my definition "total systems economics". We have hardly touched this area at all. A good example of this is the emerging composing system for library catalog cards for the Library of Congress. Significant savings will be achieved not in the actual composition of catalog cards but rather in the costs of their distribution.

And lastly,"comparative economics". We established to our satisfaction that when dealing with line printer types of publications it is far more economic to go to photo-composition. We can produce more legible and better looking publications with reductions in printing and binding costs of up to 40%.

Reference was made earlier to a cost study I did. I used the "all other things being equal" technique in the conduct of the study. That is to say I compared only the costs of composition by conventional methods to the costs of composition by various electronic systems without considering potential or actual additional usages of the machine language produced by the computer. I am not going to describe my study in detail but I should like to mention some 16 conclusions I drew. As I cite these I ask that you keep in mind that my study is addressed to one time publications.

The first thing we found, to my satisfaction, was that the use of the computer merely to perform line justification and hyphenation was not economical. In Great Britain where we had better access to engineered time standards, we found that a 6% allowance was made between non-justified and justified matter. And yet when I looked at some of the pages in my sample, I found the number of key strokes increased 10% by the requirements of the computer. Obviously, as far as input was concerned, I was 4% behind the eight ball before I started.

The second conclusion was that pages that are relatively easy to keyboard for conventional processes (for example, a

novel) actually required more keyboard input into the computer.

Thirdly, the inverse of two. Pages that were relatively difficult to keyboard for conventional processes, for example, a sample page from a book catalogue which used a lot of dot leaders, required less keyboarding with the computer because we could generate the dot leader with a code.

Fourth, pages that are time-consuming for make-up by conventional methods were in fact made up very economically by the computer.

Fifth, the volume of pages required to reach the break-even point for one-time work was far higher than the typical firm now produces. Mr. Drury mentioned the size of the typical firm in the United States. In the United Kingdom, we found the same situation prevailing.

Sixth, the volume of pages required to reach break-even for work that is revised and reissued, on a periodic basis, was lower than it would be for one-time output. It is still fairly high unless the machine language input is used for ancillary purposes.

Seventh, a firm entering the field would be well advised to purchase computer time on an as-needed basis. Such a firm would find that the more powerful computers would generally produce the lowest per page cost. This is contrary to something that came out in an earlier session in this workshop.

Eight, a firm that already has a computer may find that the least cost solution will be to obtain time on an as-needed basis from a service bureau that has a high speed CRT composer.

Ninth, I found to my satisfaction that so-called generalized software is inefficient for work that is repetitive in nature and which uses a semi-standard format. A firm doing this type of work (for example, telephone directories) would be well advised to write computer programs specific to the work to be performed.

Tenth, edit insert programming for format changes is costly and time-consuming, both with respect to the use of programmers and computer testing and debugging time (which is often overlooked).

Eleventh, certain classes of work which are parts of an integrated data processing system (telephone directories are a natural) are very good applications of this technology.

Twelfth, given the high production capability of the high speed CRT systems, it is quite likely specialized

computers will be marketed to support them. These computers should cost much less than general purpose machines and should be much faster as well. A case in point is the Wright Patterson Air Force system where a format processor built for the Air Force produces input to a Linotron 1010 at a ratio of one computer hour to every 21 Linotron 1010 hours. The Government Printing Office situation is that they use two computer hours for every one Linotron 1010 hour. That gives you some idea of what specialized hardware can do.

Thirteenth, break even points occur at lower production levels against Monotype. Monotype seems, therefore, more of a prime target than Linotype.

Fourteenth, significant structural change will occur in the composing industry to adjust to the economies of scale.

Fifteenth, the advent of the computer in the composing process with its attendant capital cost and scale requirements will require the application of system analysis techniques to the entire publication process.

Lastly, possible by-products of electronic composition (for example, automatic indexing) will open up new vistas in information processing techniques.

KUNEY

We have been in the computer composition business since 1958; had one of the first model 200 photocomposers and we are now setting four journals on a production basis using computer aided methods. One of the things we have learned is not to look at computer composition as an end in itself. The economics are negative at this stage of the game although they are improving and we feel that within a year or two, we'll be able to produce the kind of composition that we require at rates comparable to hot metal composition. This will be due in part to the fact that hot metal rates are rising at about 6% a year. So if we can just hold our effort level, they will catch up with us pretty quickly.

To my disappointment, the important thing that has not been treated in more depth here is that computer photocomposition is only important as a factor in a total information processing system. Composition itself, if we were to ask NSF (and NSF is supporting a lot of our programs), they would tell us that they care little about computer photocomposition. What they are really interested in is the role of this step in the total information processing system. I think in some of the discussions here we have lost sight of the fact that printing production is an element or step in the total process of getting material from the author to the user. That is its only value; it is not an end in itself or a process in itself. The things that govern its development, its process and its efficiency are the contribution that it makes to getting information to the

ultimate user. I was quite surprised that the person we are really concerned with, the end user, the reader, was seldom mentioned throughout our earlier discussions. Instead of user requirements, we talked about processor requirements. So I would like to emphasize in as strong a way as I can that what needs to be thought of here is not the price of the product, but the value of it. One of the problems that we all have today is that we are dealing with a product whose value we do not know. We know what the value of a printed book is and we know what the value of a printed journal is; we know that we can put these on the market and sell them at a price related to our costs, but we have very little idea at this point in time what the value is of information in a computer system. I think all of us sense that information in machine-readable data bases is going to have a lot of value - it will be big business. No less a man than Peter Drucker has prophesied that this is going to be the industry of the future.

I think we have to recognize in all of our discussions, in all of our concerns about making a profit and about cost, that one of the things we must do first is to determine what the value of our product is, that is, what the value of information is. We do not know. And I don't think we are going to know for a while. So we're going to be working for the next three or four years in this region of greyness in which we sense what the future is but we don't really know. Every great industry that was ever developed went through this phase. Whatever substance you can gather, which doesn't mean much if you need dollars in your pocket to keep going, will be helpful. The more we recognize that point, the better we are going to be able to adapt our efforts in terms of meeting the needs of the future, which is about the most that we can hope for at this time.

KING

I am not intimately familiar with this technology so the comments that I make are made partially out of ignorance. However, I do want to expand a little on what Mr. Kuney said. A speaker in an earlier session said something to the effect that the ultimate user of our product is the publisher and I feel this is not true. The ultimate user is the reader. In looking at it from a broad economic standpoint, this is a very important fact. We all recognize the cost structure of publishing which consists of high set-up (or fixed) costs with relatively small marginal costs. Computer controlled photocomposition comprises an important element of these set-up costs. Typically, publishers will attempt to keep these costs down by maintaining a highly competitive position for firms providing

this service by one means or another so that profit margins for these firms are apparently nonexistent or small at most. The unfortunate fact is that, if a shake-down in the industry forces firms out of the business and profit margins increase due to supply and demand of these services, the publishers are likely to begin to perform this activity themselves again. Thus, it seems that firms in this business must either find an additional way to cut costs and maintain quality or to find derivative uses of the tapes and services.

As indicated by Franz Alt from AIP, I think that the professional societies in particular recognize this and are defining as many as fifteen to twenty derivative products that can be used from tapes prepared for photocomposition. So I think,as Mr. Kuney said, one of the things that has to be done is to consider the overall economics under which we are operating and recognize that we're very much a captive of the economics of information. So that the primary emphasis, perhaps, ought to be in looking for new ways in using information rather than providing ways to produce more high quality primary information faster and cheaper.

ENGLE

I would also like to add my amen to what Mr. Kuney said. I suspect I played the devil's advocate in earlier sessions. I think that once in awhile we need to refrain from talking about how good it is going to be. I think it is dangerous to hang on what this whole world of computer composition will eventually become. When it started to grow in the last few years, there was a lot of glamour, a lot of mystery associated with it. It is now coming of age. We now have to really look carefully and come to grips with what the situation is today.

Now on the subject of this particular session - economics. Economics could be two different things. First might be the economics of providing these services in total. The other might be the economics of doing the various kinds of work by this new technology. Regarding total economics, it occurs to me that it seems that some companies in this business are operating under the theory that they can lose money on every job and make it up in sales volume. I doubt if this is true. When you run out the numbers on return on investment, using whatever your mark-up is on your sales or whatever numbers you used to start off with, you will come up with what has been said here several times - the volume must be high. I am speaking here of high speed computers, high speed character generators. It must be high.

Now for the economics for the specific applications of the technology. With the technology constantly changing, I really question whether we can answer in any kind of finite terms today what the economics of the various kinds of work that might be done by computer aided composition would be. As Herman Parks said, when we were talking about a so-called generalized system, rather than having one generalized system, we are probably talking about a series

of generalized systems, specialized to the various categories of composition or graphic arts products. And I tend to subscribe to that approach.

The questions then might be: how many categories should there be? What are the true needs, the true desires of publishers in each of these areas? We need to try to understand these as they really are, not as they should be, or not as they may be in the future. We at Donnelley's believe that the most important thing for long range success is not to just sell a job at a price that somebody will pay, but to provide a service to the publisher which truly meets his needs. Like Roger Schubert mentioned, we cannot afford to develop systems (not just programming systems; I mean the total manufacturing system) that really aren't wanted. The emphasis in these sessions has been primarily in the area of books. We have heard the need for standardized language. Yet publishers seem to shy away from any standardized language. Perhaps they should. Perhaps this is part of the secret of their success. But I suggest that the fact is that they probably won't standardize on a language for composition, at least not for quite some time.

We've heard it mentioned that this new technology speeds up schedules. Are schedules really that important to the publisher? And I raise this question because we demonstrated to a major book publisher a fast processing technique. We had taken one of his books and typed the copy in OCR-B font which is a very logical, legible type face; it can be read by an optical character reader. He came in one morning and we showed him the manuscript, discussed it and told him that we would start to process it through our optical character reader. The next morning we handed him the 300 pages of complete films ready for plate making. Perhaps this is more dramatic than you would want to talk about in a regular production environment; we could be talking about three or four days. What response did we get? The response was that when it takes months to complete the editorial process, printing and binding, what importance is a few days or weeks on composition?

We've heard that what book publishers need is a simple means of input. Our division demonstrated the technique of taking typewritten copy in OCR-B typeface, with no coding at all, and after the publisher marked on the copy in whatever means he wanted to choose, what he wanted to have happen, we ran this through our scanner, our computer, our VideoComp and produced a book. I have to admit that it cost more than hot metal but we did produce it with as simple an input as you can get, like a letter. But we haven't found any publishers getting in line to buy this product.

The point is that for economics to come out, there has to be volume and to get volume, you have to sell the publishers what they want. So I think the question is, are we really sure that we know what it is the publishers

do want? Is it perhaps that they are simply looking for composition that is cheaper than hot metal? Some publishers do very definitely recognize the potential future of computerized composition. They recognize that it may cost more (that is, the actual typesetting itself) and they are still determined that they must get into this field. It is interesting to note that most of those kinds of publishers are represented at this workshop. We have to be sure that we are developing these new total systems with full knowledge of just what the publishers want. Therefore, we need more information interchange of the kind taking place at this workshop. This is what I came to these sessions for - to try to understand a little bit better what is truly in the publishers' minds.

DOLBY

I think Mr. Engle has put his finger on a very important point here with respect to time. Now if you look at the whole development of the computer industry, most of the business type applications pay for themselves not so much in the savings of cost but in the speed. You buy time with computers and in most of the big applications this is what you have bought when you get around to it.

In the publishing industry, we haven't really figured out where we can buy time. We heard someone say the newspapers can still do very well with getting their paper out using hot metal. Any of you who have peeked into the Government Printing Office know that the Record is not produced by using Linotron and the primary reason, as I understand it, is that they're afraid they can't meet the time schedule. In any event, it is fairly clear that we can't really sell time as an advantage to a newspaper. In the book publishing industry, if they wanted to set at newspaper standards (the editorial standards, that is), it is perfectly feasible to publish a book overnight if you so desired, if you had enough Linotype machines. They choose not to do this; a year seems to be the standard. As Ray has said, even if we could in fact speed up their time cycle, it is clear that they don't want it. When we sell the machine, we either have to find something other than time or we have to find reuse, saving rekeyboarding. I haven't really found any other category for us to make money on. Reuse is possible. We do that with directories and that sort of thing. Time - I don't think we have sold anybody yet.

SPERR

What I referred to as the ultimate consumer in the last session, I meant the reader. But the ultimate consumer that most of the industry has to deal with is the publisher. Publishing is a very risky business. Many things which may sound very strange and unnecessary from a technical viewpoint are probably something which results from long-standing practices on how to sell books. You want to set the type but you don't care, in the final analysis, whether these books are sold or not, whether they are a success

or not. That is the responsibility of the publisher. Those who have an organization possessing all the newer composition facilities which are available today, everything from linotype to computer composition, should be the ones who should advise your customer what the best approach is for you to use. Unfortunately, there are very few computer typesetters who are also printers, who are coming from the printing industry. In this respect, I think Orrie Engle is in a very unique position. The publisher would like to have advice but price is the only thing they seem to care about. The reason is clear; that is a substantial part of the investment in getting a book published.

JOHN SEYBOLD

I think the production of magazines and newspapers is a relatively efficient operation. The production of books is disastrously inefficient. The real economy in this area, as I have said for years, is in the editorial operation. It is not fair simply to look at the manufacturing cost and say that it is more than hot metal or that it is about the same as hot metal. It is only when the editorial people realize what a lousy operation they run that this thing will be viable from that standpoint. If you know the publishing industry, you know that many people come in at 9:30, coffee break at 10:30, lunch at 11:30, come back at 3:00 and go home at 4:30. In between they push manuscripts around. The turnover in the industry is fantastic. Nobody works as a production person for more than a year. They start at McGraw Hill and learn the trade and then they go someplace else (they get good training at McGraw Hill). They might even go into business for themselves. But there has got to be a better way. Harry Sedgwick says this much more eloquently than I; he calls it a catastrophe, the whole operation of the book industry. But there are ways that the thing can be done if we can get the publishing industry to see the opportunities. The problem is they won't find them out for themselves. The big thing that we have to wrestle with is that we want improvement without investing money. And no one really wants to take a gamble. Lowell Hattery made an excellent speech a year or so ago on technological innovation and obstacles to it. He cited as the major barrier, a lack of readiness to accept change. This barrier has to be broken down. We can demonstrate right now that if you take the total cost, including the editorial cost and the manufacturing costs, the new method is a viable operation.

JONATHAN SEYBOLD

We have talked about total cost of getting information to people and to me it is really amazing that here at the end of 1970 we sat for this long and talked about costs without mentioning, except for a few tangential references, any alternative to conventional printing and binding as a way of getting information around. I am thinking particularly of microfilm. You look at the production costs of printed material as opposed to microfilm, the difference is unbelievable.

SHATZKIN

I have to agree that what Orrie Engle described is very discouraging. I also have to agree on the face of it, it seems to be evidence against the position that I am taking about the things that have to be done in book production. I think the publisher in the case he described didn't understand the value of speed. But I have to admit that we tried this internally at McGraw Hill. We produced several books in eight weeks instead of seven months by avoiding proof altogether and putting responsibility for correcting input on the compositor. Surprisingly, the editors didn't seem to think this was very important. A by-product of that experiment was not only that the book was produced in eight weeks and could eventually have been produced in five weeks, but also a proportionate part of a million dollars in proof reading cost was saved on those books.

The potential for saving substantial amounts of money and a great deal of internal labor was demonstrated. That was like selling $5 bills for a dollar and we still couldn't sell it. I think it inevitable that we will sell it eventually because all it takes is one or two publishers to begin to see it and the others have to see it. When the automobile came along, the fellow who had the horse didn't need it until there were competitors who discovered they could truck a lot faster, further and for less money with a truck than with horses. The fellow who loved horses had to give them up.

All that is required is for some publisher to use the new computer method and for some other publishers to realize the fellow down the block had a book out in eight weeks, whereas his book took nine months to come out. When it finally came out, it was out-of-date and he then had to explain to people why the things he said a year ago didn't make too much sense today. Then you will find an entirely different atmosphere.

I think it is a mistake to assume that because the initial efforts for getting this adopted by book publishers were unsuccessful that book publishers are hidebound forever. They will get there but they will have to be pushed. And sometimes that pushing comes from the competitor and the other guys come along because competition makes them come along. I think that is the direction things are going to go.

Therefore, I think it is important, contrary to what Orrie Engle said, to think about what is going to happen two years from now. If you're going to hit the target, you have to lead your target. It's not just what publishers are doing today; it is what you realize they are going to have to do three, four, five years from now which will determine the selling stance and type of systems you will develop for them.

HARMON

I am talking, I guess, with a forked tongue. First of all, experts in the microfilm industry, talking about the micropublishing industry, indicate that production and distribution costs are about 10% of conventional printing costs. I represent an organization that is a threat to the traditional printing industry. The time element particularly in the distribution is reduced immeasurably. It also makes use of the small lot production which is economical in the area of microfilm and not in conventional printing. I say with forked tongue because I also say that the microfilm used as an intermediary, as so aptly brought out by Wigington, is a way in which conventional printing can match and exceed the quality of the final output that is put in the hands of the user. So I suggest that there be an investigation of the utilization of microfilm as the intermediary in the final printing process.

DUNCAN

I have been listening trying to figure out where the standards would get a piece of the action and I think you are going to see that it is in quick, economic reuse. The alternative method, which I described earlier, is to publish straight on magnetic tape and not consider the hard copy at all. You never really expect many people, except referees, to read hard copy anyway.

So I ask you to conceive of the following, the concept of the intellectual content of the manuscript. If you can visualize the manuscript as an intellectual effort, if you can visualize the actual intellectual content that is added to it by the copy editor during mark-up, if you can visualize the extra intellectual content that may be associated with it by the use of information retrieval techniques, I think that we can call for something to write on magnetic tape that has these kinds of flags associated with the author's output. This should go pretty well. We have found no inclination in the standards committee that I have dealt with to agree on standardizing a particular bit pattern to represent quad left, quad right and these kinds of things. We see this kind of thing in the basic ASCI codes as they apply to a typewriter. When you say manuscript, you're probably thinking typewriter or pencil. Before the advent of the electronic computer, we accepted the constraints of the typing process in using notations which now can be transcribed from this basic document writer into a digitalized process. But if the standards folks come up with something, it will probably be more in the area of image codes as opposed to recital codes. ASCI uses a recital code. It is really a sequence of verbs and when these verbs are strung together, they will produce a certain effect. There is a large number of sequences that will produce the same effect. What we are driving at is we really have a tab card charted but at a very primitive level. When we punch this tab card, it is. We don't know how it got there; it 'is'. And if we can make the manuscript 'is' on magnetic tape; if we can make a copy of

the mark-up 'is' and the information retrieval mark-up 'is'; and if anybody has a need for rapid, economical reuse, it may be useful. It may end up as one of the greatest abstractions ever struck off by the mind of man.

DOUCETTE

Listening to the comments, it has become obvious to me that we have two separate approaches here. We have those who are professional printers who are working for publishers and we have people working directly for users, as exemplified by the professional societies. You might include in that last part the newspaper printers too. Although both groups are in the same business, they each have different emphasis on what they are doing. The professional publishers and printers seem to be more interested in the quality of their production in detail whereas the people who are directly connected to the user, such as the professional societies, are much more interested in getting that material out as quickly as possible and they are more interested in the unique uses and problems of that particular user.

In some instances, the two groups represented at this workshop have gotten together but the divergence is still great. Joe Kuney is still interested primarily in the ultimate user and he is not interested that much in a lot of the details which really aren't that important as long as you get that material to them.

Thinking over the broad spectrum here and considering the increase in the use of microfilm, electronic displays, magnetic tape data banks, etc., it appears that the publishing industry is going to become part of some new industry, an information handling profession or an information handling industry. And this will be a multi-media profession which is going to serve in a different mode than it has in the past and it will require those who are in it to redefine their particular role and their particular professional techniques in light of a whole new framework of activities.

HENDERSON

When we evaluate the economics of this industry and especially that of automation, we must realize that it is dynamic and continually changing. Rules of thumb that applied six months or a year ago may not be valid today. We are producing three information publications, all of which are being produced at a cost less than hot metal typesetting and we are operating at a profit. These publications range from abstract or index publications to technical manuals.

The abstract and index publications are overwhelmingly less expensive using these tools if the publisher considers his cost of organizing the information to be published. The more marginal class of work is the "one time, straight text publication" which requires little or no data manipulation (organizing). One application (the technical manuals) that we are doing is almost of this class.

When we add to the normal cost of type the cost of preparing two sets of drafts for the Army to review, and the cost of all the reproofreading required to produce these books manually, we find that the computer system is economical. We have found that time is important to our customers. For example, the Congressional Information Service publication becomes a current awareness publication as well as a retrospective search tool because it is available within a few days after the last document published for the month is delivered to Congress.

ENGLE

On the question of whether we as printers or suppliers are concerned over whether publishers sell their product, let me assure you that we are, that we want to have all of our customers profitable. The point was raised that we in the supply role should be suggesting to publishers the route they should go. We'll be very happy to sit down with any publisher and discuss our views on this subject, but I would just like to encourage publishers to sit down and think what their needs are before they talk with us. It is certainly important that we really understand the publisher's needs and policies.

We have talked in this workshop on several occasions about the problems of alterations being done in computerized photocomposition, not the easiest thing in the world to do. And yet, in discussing this subject with a major publisher, we asked him about his editors looking over things, redoing them, and so on, and asked him at what stage he, the publisher, wanted his editors to see the copy in typeset form. He said the only way they see it is if they buy a subscription.

The "Summit" on Typesetting Science

Earlier this month, an elite band of computerized typesetting's "mountain climbers" gathered in the Nation's Capital to participate in a workshop on computer photocomposition hosted by the American Society for Information Science under a grant from the National Science Foundation.

Reflecting the increasingly important and pervasive role of typesetting technology, the objectives of the workshop were formally stated as follows:

> "To provide assistance to the science information community in the exploration of the technological and related issues, which include the latest techniques, methods for employment, equipment and benefits to be obtained from the application of computer-controlled typesetting and photographic composition.
>
> "To provide an opportunity for representatives of the various interest groups...to meet and discuss papers prepared in advance by the participants on the most important issues in this field; and, to provide a record of the proceedings for the broader use by the scientific community."

While most people were preoccupied with thoughts of the impending holiday season (or of meeting year-end production quotas), 45 of the industry's "Who's Who" assembled in Washington, D.C. for a two-day computer comp summit conference. The meeting was convened to provide answers; instead, it ended up looking for the questions!

Unlike the many conferences which provide a forum for those with something to sell to lecture those who pay to hear the pitches, the ASIS gathering provided a unique opportunity for invited industry leaders to intelligently and candidly discuss computer composition among themselves. The result, as Victor Strauss so aptly stated, was not so much a clear view of the state-of-the-art, but rather a picture of the state-of-mind of the computerized typesetting industry.

A measure of that state of mind--and of the general frankness which prevailed in the discussions--was the admission by Orrie Engle of R.R.Donnelley's Electronic

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Graphics Division: "Even a year ago I could have given a good speech on the future of computer composition. Now I am confused. We have proved that you can turn out any kind of page by computer and CRT composition. The question is, can it be done economically?"

Although sometimes stated in dramatic terms, this aura of humbled uncertainty resulted not in paralyzing panic and indecision, but rather in an increased willingness to listen as well as to talk, and to query as well as proclaim.

At the heart of the probing lay a concern for the entire composition process from author to press, and a realization that you could not tackle some piece of this process without a clear picture of the whole. The representatives of virtually all of the equipment manufacturers present, as well as those from a number of the commercial computerized composition firms, all argued that they could not develop equipment or computer programs without a clear idea of what the customer wanted (and was willing to pay for) and, more often than not, the customer just does not know.

In fact, both the customer and the supplier are still at the point of exploring the possibilities together. Yet, interestingly, in spite of the uncertainty, not one participant at the conference regretted his involvement or that of his company in new typesetting technologies. Whatever the problems, all were convinced that times are rapidly changing, and that those who commit themselves to the change would be the ones who learn best how to master it, and ultimately profit from it.

Most of the probing, as to the best means of exploiting computer composition, inevitably touched upon the hard facts of software. John Seybold and others argued that the industry's major problem is that the composition software which is now generally available is cumbersome, inefficient, and woefully inadequate.

Roger Schubert of RCA, and Fred Faulkner of the Graphic Arts Data Service, both contended that adequate hardware and software exists for those willing to pay for it, but that people were generally unwilling to use the tools available.

Several times, the group returned to a debate of the merits of generalized versus specialized composition systems. Middle ground was claimed by those who rallied around the prediction made by Herman Parks of Time-Life, that the future would most probably see a number of generalized systems developed for specific classes of composition--a system for periodicals, one for chemical formulas, one for bookwork, and so forth.

Spurred by Bill Tunnicliffe's presentation of a System-X input philosophy, the generalized-specialized conflict spilled over into the input arena. Many of the attendees were intrigued with the concept of a universal input language which could be interfaced to any text processing system.

Howard Tompkins of IEEE warned however, that, unlike present systems, such schemes must "underwhelm" the user rather than overwhelm him. He later decided that it would be sufficient if the system simply "whelmed" the user, but the caveat still remained: Much of computer typesetting is so complicated that almost no one can fully master it. Anything which is to gain wide acceptance must be simple, and almost painfully easy to use.

Whether or not it could be accomplished through a universal input language, the general approach of completely *separating copy preparation from computer processing for* typesetting found wide support from those assembled. Certainly the vision of the perfect tape which can be fed into the perfect box to produce perfect pages will hold a deep fascination for anyone who has ever wrestled with the realities of contemporary composition.

But desirable as this might appear for certain types of work, no one pretended for a moment that it was likely to happen tomorrow, that it would present a solution for all classes of composition, or that it even began to answer the question of who is to create the perfect input tape, and how they are to do it. No more imminent was the plan to build that perfect box.

In these, as well as other areas of discussion, most of the summit conferees did not seem totally convinced of anything any more. The old missionary zealots had become rational agnostics; and a meeting which even a year ago might simply have catalogued 45 separate solutions to the world's problems, instead reflected a deep and profound concern over the future of automated composition.

Yet, as nice as it is to be sure of something, the doubts and questions may be extremely healthy. It may be worth holding a meeting just to finally agree that we don't have all the answers. Certainly, any attempt to find better solutions for the future must be founded on the firm realization that better solutions are indeed needed.

And, with necessity being the mother of invention, perhaps we are finally coming close to the birth of the day in which practice catches up to promise, and computerized typesetting becomes at least half as profitable as it has been fashionable!

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